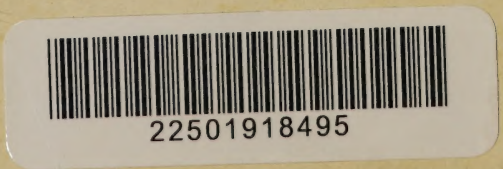
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JOURNAL

OF THE

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VOL. LXII.

PART II. (NATURAL HISTORY, &c.)

(Nos. I TO IV.—1893.)

WITH INDEX

EDITED BY THE

NATURAL HISTORY SECRETARY.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.

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LIST OF CONTRIBUTORS.

	Page
Alcock, A.;—*On some Newly-recorded Corals from the Indian Seas (Plate V.)*	138
———*On some* Actiniaria *from the Indian Seas*	151
———*Natural History Notes from H. M. Indian Marine Survey Steamer, 'Investigator,' Commander C. F. Oldham, R. N., Commanding.* Series II., No. 9. *An Account of the Deep Sea Collection made during the Season of* 1892–93. *(Plates VIII. and IX.)*	169
Heinig, R. L.;—*Blind Root-suckers of the Sunderbans (Plate VI.)*	158
Holland, Thomas H.;—*The Petrology of Job Charnock's Tombstone*	162
———*On a slab of Chinese Agglomerate lava bearing a Chinese Inscription discovered in St. John's Churchyard, Calcutta. (Plate VII.)*	164
King, George.;—*Materials for a Flora of the Malayan Peninsula, No. V.*	87
———*Ditto No. VI.*	189
———*On some Indian Species of Canarium (Plates X to XIII.)*	184
Nicéville, Lionel de;—*On* Erites, *an Oriental genus of Satyrid Butterflies*	1
Prain, D.;—*Two species of* Pedicularis. *(Plates I. and II.)*	7
———Noviciæ Indicæ VI. *A review of the genus* Colquhounia	30
———*On the Flora of* Narcondam *and* Barren Island *(Plates III. and IV.)*	39
———*Note on some methods of preparing botanical specimens, communicating Memoranda by* Messrs. C. Maries *and* R. Pantling	153
Waterhouse, J.;—*Some observations of the Electrical action of Light upon Silver and its Haloid Compounds*	10

Dates of Issue. Part II, 1893.

No. I.—Containing pp. 1–38, with Plates I. and II. was issued on June 3rd, 1893.

No. II.—Containing pp. 39–150, with Plates III. IV. and V. was issued on August 12th, 1893.

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No. IV.—Containing pp. 169–262, with Plates VIII. IX. X. XI. XII. and XIII. was issued on March 6th, 1894.

LIST OF PLATES.

No. I.—*Pedicularis diffusa*, Prain.
No. II.— „ *flaccida*, „
No. III.—Sketch Map of the Andaman Sea.
No. IV.— „ „ „ „ „ Group.
No. V.—Corals from the Indian Seas.
No. VI.—Blind Root-suckers of the Sunderbans.
No. VII.—Quartz in Chinese Acid Rocks.
No. VIII.—Indian Echinoderms and Corals.
No. IX.— „ Deep sea fishes.
No. X.—*Canarium bengalense*, Roxb.
No. XI.— „ *strictum*, „
No. XII.— „ *sikkimense*, King.
No. XIII.— „ *reziniferum*, Brace.

JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

Part II.—NATURAL SCIENCE.

No. I.—1893.

I.—*On* Erites, *an oriental genus of satyrid butterflies*:—*By* Lionel de Nicéville, F. E. S., C. M. Z. S.

[Received 16th February;—Read 1st March, 1893.]

The genus *Erites* at the present date contains five species only, (six if *E. ochreana* is held to be a distinct species, I have not seen it), found in Assam, Burma, the Malay Peninsula, Sumatra, Java, Labuan, Borneo, and the Philippines. To these I now propose to add a sixth. All are closely allied, and very similar in general aspect. They are extremely delicate butterflies, semi-transparent, of a brownish-ochreous shade, sometimes just tinted with violaceous on the upperside. All possess a submarginal series of ocelli to both wings, more or less visible on the upperside. These ocelli vary greatly in size, in some species they are large and prominent, in others quite small and inconspicuous. On the underside there are usually two discal bands, often more or less angled. These butterflies are found only in virgin forests as far as I am aware, and fly weakly close to the ground amongst the brushwood under the great trees and in open paths through the forests. Their transformations are unknown. The males have no secondary sexual characters. The females differ only from the males in the wings being somewhat broader, and in having the apex of the forewing more rounded.

I give below a key by which the several species may be distinguished :—

Key to the species of *Erites*.

A. Forewing with five equal-sized ocelli.
  1. *E. elegans*, Borneo.
B. Forewing with the posterior ocellus very much larger than the others.
  a. Forewing with the large ocellus on the upperside prominently pupilled with white. The apex of the wing falcate.
  2. *E. falcipennis*, Assam; Burma.
  b. Forewing with the large ocellus on the upperside blind or nearly so. The apex of the wing rounded.
    b^1. Both wings with all the ocelli prominent and well-formed on the underside.
      a^2. Forewing with three small apical ocelli only in addition to the large anal one.
  3. *E. medura*, Java; Philippines.
      b^2. Forewing with four apical ocelli in addition to the large anal one.
        a^3. The inner discal band on the hindwing straight.
  4. *E. argentina*, Labuan; Borneo; Malacca.
        b^3. The inner discal band on the hindwing highly angled outwards in the middle.
  5. *E. angularis*, Burma; Malay Peninsula; Sumatra.
    b^1. Both wings with all the ocelli inconspicuous except the anal one in the forewing, reduced to black dots only.
  6. *E. rotundata*, Burma.

1. Erites elegans, Butler.

E. elegans, Butler, Cat. Diurn. Lep. B. M., *Satyridæ*, p. 147, n. 2, pl. ii, fig. 4, *female* (1868); id., Druce, Proc. Zool. Soc. Lond., 1873, p. 340, n. 2; id., Staudinger, Ex. Schmett., p. 230, pl. lxxxii, *male* (1887).

Habitat: Borneo (*Butler, British Museum; Druce; Staudinger*); three males Borneo, one female Padas River, North Borneo (*collection de Nicéville*).

2. Erites falcipennis, W.-M. and de N.

E. falcipennis, Wood-Mason and de Nicéville, Butt. of India, vol. i, p. 237, n. 230 (1883); idem, id., Journ. A. S. B., vol. lv, pt. 2, p. 351, n. 30, pl. xvi, fig. 2, *male* (1887).

Habitat: One male Silcuri, August; one male, Nemotha, September —both in Cachar, Assam (*Wood-Mason, collection Indian Museum*); one male, Fort Lungleh, Lushai Hills, October, 1890 (*R. Pughe, collection de Nicéville*); one female, Karen Hills, Burma, April (*collection Phayre Museum, Rangoon*).

3. Erites medura, Horsfield.

Hipparchia medura, Horsfield, Cat. Lep. Mus. E. I. C., pl. v, figs. 8, 8*a*, *female* (1829); *Erites medura*, Marshall and de Nicéville, Butt. of India, vol. i, p. 236 (1883); id, Pagenstecher, Jahr. des Nass. Vereins fur Natur., vol. xliii, p. 96, n. 15 (1890); *E. medura*, var. *ochreana*, Staudinger, Iris, vol. ii, p. 38 (1889); *E. ochreana*, Semper, Schmett. Philipp. Inseln, p. 326, n. 497 (1892); *Satyrus* (*Erites*) *madura* (*sic*), Westwood, Gen. Diurn. Lep., vol. ii, p. 392, n. 47 (1851); *Erites madura*, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 229, n. 484 (1857); id., Hewitson, Journ. Linn. Soc. Lond., Zoology, vol. viii, p. 145 (1865); id., Butler, Cat. Diurn. Lep. B. M., *Satyridæ*, p. 146, n. 1 (1868).

Habitat: Java (*one female, Horsfield collection in the British Museum*); East Java (*Pagenstecher*); Palawan, Philippines (*Staudinger*).

Mr. Hewitson (l. c.) describes a variety of this species as follows:—"*Male* and *female*. With five ocelli on the anterior wing, one large and four small. Sumatra; Singapore." This almost certainly equals *E. angularis*, Moore, which undoubtedly occurs in the Malay Peninsula, and also in Sumatra, as Dr. L. Martin, of Deli, Sumatra, informs me.

Mr. Hewitson also describes another variety thus:—"*Male* and *female*. With the five ocelli of the anterior wing small and of equal size, Singapore; Sarawak." This can only refer to *E elegans*, which certainly occurs in Borneo, but very doubtfully in Singapore, at any rate it is not recorded from thence by Mr. Distant in "Rhopalocera Malayana," nor have I seen a specimen from any part of the Malay Peninsula.

4. Erites argentina, Butler.

E. argentina, Butler, Cat. Diurn. Lep. B. M., *Satyridæ*, p. 188, n. 5, pl. v, fig. 8, *female* (1868); id., Druce, Proc. Zool. Soc. Lond., 1873, p. 340, n. 1; id., Distant, Ann. and Mag. of Nat. Hist., fifth series, vol. xix, p. 48, n. 21 (1887).

Habitat: Labuan, an island off the N.-W. coast of Borneo (*Butler, in coll. British Museum*); Borneo (*Druce* and *Distant*); Borneo; Malacca (*Staudinger*); S.-E. Borneo (*collection de Nicéville*).

Unfortunately I possess no specimen of *E. medura*; but comparing the figures of *E. medura* and *E. argentina*, both taken from female specimens, and a single male of the latter in my collection, the only point of difference I can discover between them is that *E. medura* lacks a small ocellus in the second median interspace of the forewing which is present in *E. argentina*.

5. Erites angularis, Moore.

E. angularis, Moore, Proc. Zool. Soc. Lond., 1878, p. 825; id., Distant, Rhop. Malay., p. 46, n. 1, pl. v, fig. 3, *male* (1882); id., Marshall and de Nicéville, Butt. of India, vol. i, p. 236, n. 229, pl. xvi, fig. 50, *female* (1883).

Habitat: Taoo plateau, 3,000—5,000 feet, Upper Tenasserim

(*Moore*) ; Perak (*Distant*) ; Meplay Valley, January ; Thoungyeen forests, March ; near Moulmein, October (*Marshall* and *de Nicéville*) ; Yoonzaleen Valley, November ; Myitta, January, both in Burma ; Rawan, Selangor, Malay Peninsula, December (*collection de Nicéville*).

In this species there are four small equal-sized ocelli and one large ocellus to the forewing, the ocelli of the hindwing prominent ; the inner band of the hindwing strongly outwardly angled in the middle ; the outer band is twice outwardly angled, once in the middle, and once where it is crossed by the second subcostal nervule, this feature being only found in the otherwise quite distinct species, *E. elegans*.

6. Erites rotundata, n. sp.

E angularis, Watson (*nec* Moore), Journ. Bomb. Nat. Hist. Soc., vol. iii, p. 19, n. 38 (1888).

Habitat : Burma.

Expanse : ♂, 2·0 to 2·1 ; ♀, 2·2 to 2·4 inches.

Description : Male. Upperside, *both wings* semi-transparent, brownish-ochreous. *Forewing* with the two discal bands of the underside showing through by transparency ; a large, almost round (slightly oval) black ocellus in the first median interspace and extending slightly into the two interspaces beyond, obscurely pupilled with plumbeous, and surrounded with an ochreous ring. *Hindwing* with a prominent discal ochreous band, outwardly angled in the middle ; four large round blind black ocelli, surrounded each by a very wide ochreous ring, the rings touching, thus forming a continuous band, one ocellus in each interspace from the first median to the second subcostal nervule ; two fine ochreous and two fine fuscous marginal lines. Underside, *both wings* finely striated with purplish-fuscous ; the four apical ocelli present in the forewing of *E. angularis*, Moore and the five of the hindwing reduced to minute black dots in this species. *Forewing* with the fifth large ocellus much as above, but the black portion is smaller, the ochreous ring wider, and the pupil prominent and silvery ; two prominent discal deep ochreous bands outwardly sharply defined by a black thread commencing close to the submedian nervure, the inner band straight, crossing the discoidal cell obliquely about its middle, and becoming lost before reaching the subcostal nervure ; the outer band curved and bounding the wide ochreous outer ring of the large ocellus in the first median interspace, the band ending on the third median nervule. *Hindwing* with faint traces of two discal bands, the inner one straight, the outer one angled outwardly once only, as in all the species of the genus except *E. angularis* ; the marginal lines as on the upperside. Female hardly differs from the male, except that the wings are broader,

the apex of the forewing is more rounded, and the forewing has similar fine marginal lines as are found in the hindwing of the male. This species differs structurally from *E. angularis* in that the tooth or angulation at the termination of the second median nervule of the hindwing is as great or greater than that at the third; in *E. angularis* this tooth is quite small.

In one specimen in my collection from the Pegu Yoma, taken in December, the markings are almost as prominent on the underside as in *E. angularis*, there are two apical well-formed ocelli to the forewing, and five ocelli to the hindwing, the discal bands well-marked, but as the inner band of the hindwing is straight (not outwardly strongly angled in the middle), and the outer band is once outwardly angled only (instead of twice), I have no hesitation in placing this specimen under *E. rotundata* rather than under *E. angularis*. Another specimen in my collection taken at the same place and time is quite typical *E. rotundata*.

In the Proceedings of the Zoological Society of London for 1891, page 268, Mr. H. J. Elwes records *E. medura*, Horsfield, from East Pegu, Upper Burma, and places *E. angularis*, Moore, with a query as a synonym of that species, and makes the following remarks :—

"Numerous specimens were sent by Doherty from East Pegu, taken at about 1,500 feet [during March and April], of which several females and one male were by him supposed to be, and marked as, a distinct species. These correspond to the female taken in the Thoungyeen forests by Major Bingham, and described by Marshall and de Nicéville, 'Butt. of India,' vol. i, p. 237,* as nearer to *E. medura* of Java than to *E. angularis*."

"After examining the series closely and comparing them with one Javan specimen, I do not see how to separate the two species [*E. medura*, Horsfield, and *E. angularis*, Moore], for, though in the supposed new

* "A female taken in the Thoungyeen forests in March differs from our other female specimens in the ocellus on the upperside of the *forewing* being very nearly round, not oval, with a distinct yellow iris of equal width throughout; the outer fascia of the *hindwing* much broader and very distinct; four large black spots beyond twice the size of those in the other specimens, the yellow irides prominent and touching. On the underside of the *hindwing* the two discal fasciæ have almost disappeared, and the five submarginal ocelli are very minute. This specimen differs only in the following particulars from Horsfield's figure of *E. medura*: The outer margin of the forewing is not quite so evenly rounded, being in fact slightly concave; the large ocellus is not quite so large as in *E. medura*, and the iris is less wide. On the underside the apical ocelli on the forewing are smaller, and on the hindwing the ocelli are minute, and the fasciæ are obsolete. This specimen, however, is much nearer *E. medura* than *E. angularis*." (*Marshall* and *de Nicéville*, l. c.)

species the ocelli on the upperside of the hindwing are much larger than in the other form from the same locality, whilst on the underside both the ocelli and the bands are almost obsolete, I am rather inclined to suspect seasonal dimorphism, and to think that this form is the last of the first brood, and the others, among which males are far more numerous, are the first of a second brood. In the Javan specimen we have the hindwing like one form below and the other above. Further observations are requisite to decide the question."

E. medura and *E. angularis* are abundantly distinct. The former has three apical ocelli in the forewing, the inner discal band straight, the outer band apparently once outwardly angled in the hindwing; while the latter has four apical ocelli, the inner band outwardly angled in the middle, the outer band twice outwardly angled.

Mr. Elwes suggests that seasonal dimorphism may occur in the genus. At present I see no indications of the appearance of this phenomenon, at any rate if the usual form of seasonal dimorphism observable in the *Satyrinæ* is understood. I possess the strongly ocellated *E. undularis* taken in January, October, November, and December, all of which months (except occasionally October) are dry months, when the ocelli should be obsolete: while the two type specimens of *E. falcipennis* were taken in the height of the rainy season, August and September, but have minute ocelli, instead of the normal rainy-seasonal large and well-developed ocelli. I append a note by Mr. W. Doherty on the subject, which bears out my opinion, and I may add that it is at his suggestion that I have described *E. rotundata*.

"The prehensors of *Erites* are slender and simple, and of the usual satyrid type, resembling those of most of the species of *Lethe* (*Debis*), to which the genus seems allied, the true *Lethe* (*europa*, Fabricius) being exceptional in having the upper organ without branches. Seen from the side, the upper organ (uncus, tegumen) of *E. angularis* is unusually straight; that of *E. rotundata* is much more depressed terminally. In both species the lower organ (clasp, harpago) is truncate at the tip, but in *E. angularis* it is cut square, while in *E. rotundata* the end is concave, so as to form a distinct scallop."

"Apart from these differences in the prehensors, I think Mr. Elwes' supposition, that *E. rotundata* may be the dry-season form of *E. angularis*, an unlikely one. No seasonal variation has yet been observed in the genus. I found *E. angularis*, which should be the wet-season form, commoner in the dry-season than *E. rotundata*. Finally, the dimorphism, if it exists, must be of a new type. Dry-season forms are distinguished by obliterated ocelli and angular wings, but here the non-ocellate form has the wings abnormally rounded."

I possess the following examples of *E. rotundata*. One male and one female from Beeling, Upper Burma, taken on 27th March, 1886, two males on the 29th idem, one female on the 14th April, by Lieut. E. Y. Watson; two males taken in the Pegu Yoma, Burma, by a native collector employed by the Phayre Museum, Rangoon, in December; one female from Quaymoo, Tenasserim, captured in March and another in November, in the Yoonzaleen Valley, also in Tenasserim by Major C. T. Bingham.

Two species of Pedicularis.—*By* D. Prain.

(With Plates I and II.)

[Received March 9th—Read April 5th.]

In 1889 (*Journ. As. Soc. Beng.* lviii pt. 2, p. 255) the writer had the honour to communicate to the Society descriptions of a number of new Indian species of this genus. Since then a considerable number of new species have been reported from China and Tibet and have been described in various periodicals by Messrs Maximowic, Hemsley and Franchet, and by the writer. Now, another new Indian species has been reported; of this a description is given below and the present opportunity is taken of describing an allied new species from Szechuen.

1. Pedicularis diffusa Prain, *sp. nov.* (Pl. I.)

Elata simplex vel e collo diffuse ramosa, radice debili ramosa collo esquamato, caulibus gracilibus simplicibus, *foliis* radicalibus longe petiolatis mox evanescentibus caulinis 4-natim verticillatis laminis glabrescentibus ovato-oblongis pinnatisectis, segmentis 5–8-jugis oblongis obtusis inciso-serratis; *floribus* verticillatis verticillis numerosis inter se remotis, bracteis foliaceis oblongo-ovatis petiolatis pinnatifidis et inciso-serratis; *calycis* breve pedicellati campanulati membranacei inflati totius reticulati antice vix fissi dentibus majusculis inaequilatis anticis et lateralibus ovatis inciso-serratis illis duplo his 4-plo summo deltoideo integro latioribus; *corollae* roseae tubo sursum ampliato calyce duplo longiore basi infracto, labio 3-lobo lobis oblongo-ovatis margine sinuatis lateralibus medio dimidio majoribus, galea leviter arcuata tubo subcontinua apice subincurva erostri; *staminibus* ex adverso summi ovarii insertis filamentis anticis superne hirsutis; *ovario* ovoideo stigmate parum exserto, *capsula* anguste lanceolata apice acuta calyce duplo longiore, seminibus ovoideis testa nigrescente minute reticulatis.

In Himalaya orientali: Sikkim, Mt. Tankra, 11,500 p. s. m.; *G. A. Gammie!*

Caulibus 40–60 cm. longis, foliis caulinis 2–2·5 cm. longis his 0·75–1 cm. latis, segmentis 5 mm. longis 3 mm. latis, petiolis 0·5–1 cm. longis; calyce 6 mm. longo hoc 3·5 mm. lato; corollae tubo 10 mm. longo apice 4 mm. lato, galea 5 mm. longa, labio 8 mm. lato; capsula 12 mm. longa 5 mm. lata.

This species is most nearly related to *P. verticillata* Linn. and *P. refracta* Maxim. but besides differing greatly in habit and foliage from both it differs from *P. verticillata* in having a calyx with large teeth and with a tube reticulated throughout, while it differs from *P. refracta* in having the anterior and lateral calyx teeth serrate and not entire; from both it differs in having acute, not muticous, anther-cells.

Of Indian species, it in habit much resembles *P. flexuosa* Hook. f., though it is glabrescent while that species is hirsute, but the plant that it imitates most closely is *P. gracilis* Wall. var. *macrocarpa* Prain, the likeness being so great that though in flower they differ so widely, it is not easy to distinguish fruiting specimens of the two.

2. Pedicularis flaccida Prain; *sp. nov.* (Pl. II.).

Ascendens glabra caulibus gracilibus corymbosim ramosis, *foliis* ramisque 3–4-natim verticillatis radicalibus mox evanescentibus caulinis breve petiolatis ovatis pinnatifidis segmentis 5–6-jugis obtusis inciso-serratis; *floribus* in verticillis 4-floris paucis remotisque dispositis, bracteis foliaceis calycem excedentibus; *calycis* glaberrimi parvuli campanulati antice parum fissi 5-dentati segmentis omnibus oblongis integris tubo costato nec reticulato; *corollae* tubo sursum ampliato calycem 3-plo excedente basi infracto, labio 3-lobo lobis lateralibus ovatis medio orbiculato basi constricto 3-plo majoribus, galea leviter arcuata tubo subcontinua apice subincurva erostri, *staminibus* ex adverso medii ovarii insertis omnibus glabris, antheris contiguis muticis; *ovario* ovoideo stigmate exserto.

In China occidentali; Szechuen occident. prope Tachienlu, *Pratt* n. 471!

Caulibus 20–25 cm. longis foliis caulinis 1 cm. longis his 0·7 cm. latis segmentis 2 mm. longis 1 mm. latis, petiolis 0·5 cm. longis; calyce 2·5 mm. longo hoc 2 mm. lato; corollae tubo 8 mm. longo apice 4·5 mm. lato, galea 4 mm. longa, labio 7 mm. lato.

Like the preceding species this is also closely related to *P. verticillata* Linn. but differs considerably in habit, and though it has the calyx tube ribbed and not reticulated just as *P. verticillata* has, it differs in having the calyx distinctly toothed and extremely small. The stamens also differ in being all glabrous whereas in *P. verticillata* the anterior

VERTICILLATAE.

Galea less than half the length of the lip :—
- Bracts flabellate, spike long, dense; calyx small, subglobose, not cleft, teeth small, entire; anterior filaments hairy ... *P. spicata.*
- Bracts oblong or linear, spike short; calyx large ovate, teeth large :—
  - Calyx not cleft, teeth crested except the upper; filaments not hairy ... *P. lineata.*
  - Calyx cleft, teeth all entire; anterior filaments hairy ... ... *P. likiangensis.*

Galea about equal in length to the lip :—
- Calyx-tube not net-veined between the ribs :—
  - Calyx cleft, hardly toothed; anthers discrete, anterior filaments hairy ... *P. verticillata.*
  - Calyx not cleft, distinctly toothed; anthers contiguous, filaments not hairy ... *P. flaccida.*
- Calyx-tube net-veined between the ribs :—
  - Calyx hardly cleft, teeth crested except the upper; anterior filaments hairy... *P. diffusa.*
  - Calyx distinctly cleft, teeth entire :—
    - Margin of galea even; anterior filaments hairy ... ... *P. refracta.*
    - Margin of galea-toothed; filaments not hairy ... ... *P. szetschuanica.*

Explanation of the Plates.

PLATE I. Pedicularis diffusa *Prain.*

1, Flower with bract; 2, calyx with ovary and style; 3, half of corolla showing staminal insertion; 4, stamens; 5, capsule; 6 seed: 1, 2, 3 *and* 5 *magnified* $\frac{2}{1}$; 4 *and* 6 *magnified* $\frac{4}{1}$.

PLATE II. Pedicularis flaccida *Prain.*

1, Flower with bract; 2, calyx with ovary and style; 3, half of corolla showing staminal insertion: *all magnified* $\frac{2}{1}$.

Some Observations of the Electrical action of Light upon Silver and its Haloid Compounds :—By Colonel J. Waterhouse, I. S. C., *Assistant Surveyor General of India.*

[Received April 20th : Read May 3rd.]

In my paper on "Electro-chemical Reversals with Thio-carbamides," read at the meeting of the Society in April 1891, it was shown that the peculiar reversals of the photographic image produced by the addition of very minute quantities of a thio-carbamide, or sulphourea, to an eikonogen developer appeared to be connected with and accompanied by electro-chemical action, if not actually brought about by it. It was remarked also that the experiments brought forward pointed to the conclusion that, at any rate as regards the haloid salts of silver, the formation and development of the photographic image is to a very great extent influenced by electrical action, more so perhaps than has generally been recognised, although the fact of photographic action being accompanied by electrical phenomena has been known since the earliest days of photography. It was suggested that a further investigation into the theory of photography based on electrochemical laws, might be of value in throwing light upon much that is now obscure and uncertain as regards the formation and development of the invisible photographic image formed by the exposure to light of silver haloid compounds.

Since that time I have given a good deal of attention to the subject and tried several experiments in various ways with the object of ascertaining the electrical action of light, in connection with photography, on plates of pure silver immersed in various fluids as well as on dry plates and other forms of silver haloid compounds in ordinary photographic use. Also on the action of electrical currents in forming developable compounds of silver haloids similar to those formed by light, and, further, on the electrolysis of ordinary photographic developers and on the currents produced during the development of the photographic image. These observations are not yet sufficiently complete to found any sound deductions upon, but I hope to complete them later. In the meantime, I have thought that a short note on some observations I have lately made on the electrical action of light upon plain silver plates in various solutions, might be of interest and form a suitable introduction to any further notes on this subject I may be able to bring before you. It does not pretend to be complete or exhaustive, and can only be considered as a contribution towards a systematic investigation of the question.

A great many observations have been made from time to time of the electrical influence of light on metals immersed in water and various saline solutions, and before going further, it seems desirable to give a brief summary of these observations, and more particularly of those relating to silver and its salts.

More than half a century ago, in 1839, Edmond Becquerel was the first to show that the electrical action accompanying the chemical changes brought about by the influence of light upon various substances, including several metals and the silver haloids, could be observed with the aid of a very delicate galvanometer. He found that this action was quite independent of any calorific radiation or heating of one electrode more than another, but was powerfully affected by the different rays of the spectrum, the greatest action being produced by the violet, indigo and blue rays, while with the green, yellow and red rays there was little or no action. Becquerel's observations are fully summarized in his work, "*La Lumière, ses causes et ses effets*," Vol. II. To observe these effects he used a covered vessel divided into two parts by a thin membrane. In each of the compartments he placed a plate of platinum or gold, previously made red-hot to remove all impurities, the plates being connected with the poles of a very sensitive galvanometer, and laid horizontally in the apparatus. Each compartment had a moveable cover. He found that when the two compartments contained an alkaline solution, the plate exposed to the solar rays took negative electricity, while the reverse occurred if the solution were acid. With alterable metals, such as silver or brass, analogous effects were obtained and the electrical effect could be largely increased by giving the plates a preliminary polarisation by plunging them in water and then placing them in connection with the positive pole of a battery. When two silver plates were immersed in water acidulated with nitric acid exposure to light of one plate only produced a very weak current and the exposed plate was always positive. If the gold or platinum plates had been thoroughly cleaned, had remained in strong nitric acid and had been made red hot, the different parts of the spectrum were almost powerless to produce electric currents. With well cleaned silver plates which had been heated several times the effects were also almost *nil*, though not quite absent, and from this fact it seemed possible that when the plates were not in this state the effects produced might be due to the action of light upon corpuscles of organic matter adhering to the plates which become oxidised by the action of light, the water supplying the oxygen. If this effect did not take place and there was no alteration in the plates themselves the light must produce a disturbance of the particles, but the former supposition seemed most probable. He found that when

silver chloride, iodide or bromide, precipitated in a thin layer on sheets of platinum or gold, was exposed to light as above, the exposed plate was positive, and that the initial action was much stronger with the bromide than with the chloride; though the intensity of the currents observed was variable and depended on the thickness of the film of bromide, moreover the electrical action was soon exhausted. With the iodide the current was almost as strong as with the chloride, but did not remain constant so long.

When plates of silver were employed, instead of platinum or gold, as a support for the haloids, the effects noted were stronger and more regular, but it was found that the direction of the current depended on the thickness of the films; with thin coatings the exposed plate was positive, and with thick coatings negative. This was markedly the case with plates of silver exposed to the vapours of iodine. With vapour of bromine the exposed silver plate was negative, the initial current, even with diffused light, was very strong, but after remaining exposed to light for some minutes then protected from light and again exposed to its influence, it was found that the current was very weak. A film of silver chloride prepared by exposing a silver plate to the vapour of chlorine gave only a very weak effect, but plates coated with the violet subchloride behaved very well in these trials and yielded for a long time results from which comparisons could be made.

On the basis of these experiments Becquerel invented his electrochemical actinometer which was practically a voltaic element or cell composed of two plates of very pure silver coated usually with the violet subchloride of silver and plunged into a conducting fluid composed of two parts of monohydrated sulphuric acid in 100 parts of water. The apparatus was so arranged that all light was excluded, except from an adjustable opening on one side by which one of the plates could be exposed to light while the other remained in darkness.

When diffused daylight or sunshine acted upon one of the plates, more or less deviation of the needle was observed which remained constant so long as the light remained of the same intensity and the surface was sufficiently sensitive. If the light was shut off, the needle returned to zero or somewhat beyond it, but soon regained its original position. If the light remained of the same intensity and the plate was again exposed, the electrical effect was the same as before, always provided that the sensibility of the plate remained the same, for which purpose the sensitive coating should be sufficiently thick. Under favourable conditions the sensibility of the instrument might be preserved for a whole day and thus several consecutive observations might be made.

The deflections of the needle could not, however, be considered as

proportional to the intensity of the chemical action exerted on the substance and consequently to the active luminous intensity; they only shewed whether this luminous intensity was greater or less in one circumstance or in another.

With this instrument Becquerel observed the effect of different rays of the spectrum on silver iodide and violet subchloride, and found that in both cases the maximum of action was in the green about D $\frac{2}{3}$ E; but while with the chloride the action decreased on both sides of this point, and ceased at A and H, with the iodide that had already been exposed there was a second maximum in the indigo blue about G $\frac{2}{5}$ H, and thence the action decreased to P in the ultra-violet. In neither case was any reversed action observed in the red rays, as observed with sensitive papers, but that might be due to the fact that in one case the sensitive surface was in water and in the other in air. Becquerel has not recorded any corresponding observations with silver bromide.

About 1840, Robert Hunt repeated Becquerel's experiments with many modifications, and the results he obtained (*Phil. Mag.*, XVI, 1840), completely confirmed them. More careful trials with the spectrum on plates of different metals made later showed that every ray of the spectrum produces an electrical disturbance. The rays, however, at the least refrangible end, produce a deflection of the needle in one direction, whilst the most refrangible rays set up a disturbance in an opposite direction. There are many indications of a condition analogous to polarity in the action of the prismatic rays. (*Researches on Light*, p. 295.) Hunt also remarks that "This action is only to be regarded as one of the evidences of chemical disturbance, exciting electrical currents; yet at the same time, it opens the question of the identity of the agent producing this disturbance and electricity."

In 1858, Grove (*Phil. Mag.*, XVI., (4), p. 426.) recorded that he had succeeded in obtaining a deflection of the galvanometer needle by allowing a beam of light suddenly to impinge on a daguerreotype plate in a trough of water, the plate being connected with one pole of the galvanometer and a gridiron of silver wire in front of the plate with the other. In experiments with platinum plates he came to the conclusion that the action of light was always in the direction of the polarisation current, though further experiments by Becquerel and others have shown that this is not the case.

In 1863, Pacinotti found that when pairs of plates of copper, zinc, iron or lead were immersed in solutions of certain salts of the same metals, the exposed plate was always negative, but with plates of silver immersed in a solution of nitrate of silver the plate exposed to sunshine

was positive, whereas if exposed to the rays of a petroleum lamp, or of a heated thick iron plate it was negative, as were also the other metals. (*Cimento*, XVIII, p. 363.)

In 1875, Hankel published a series of observations on this subject (*Wied. Ann.*, I, 1877) in which he showed that the electrical behaviour of the metals under the influence of light depended very much on the condition of their surfaces; consequently, in such observations it is necessary to consider separately each state of surface. His observations were made on copper in different states, tin, brass, zinc, platinum and silver. With regard to the latter, he records that when two plates of fairly pure silver were immersed in filtered tap water, the plate exposed to the light of white clouds was negative. When the plates had been left a day in the water the rays of the setting sun still gave a pretty strong negative impulsion. Platinum plates coated with silver were slightly positive with white or blue light, while red light produced no effect. Silver plates coated with platinum, (old platinised silver battery plates) which were slightly negative when coupled in circuit with plain platinum, were found to be very sensitive to light, and the exposed plate was positive. With coloured glasses the action was strongest under blue glass, but was also quite strong under yellow and red glasses; gaslight also produced a pretty strong deviations of the galvanometer needle, and it was found that the action under dark red and blue glasses was stronger than under a light green which was much more transparent.

In 1878, Professor Dewar published a preliminary note on "Experiments in electric photometry," (*Proc. Roy. Soc.*, XXVII, 1878, p. 364) in which he dealt principally with the construction of the best form of cell for the general investigation of the electrical actions induced by light on fluid substances. He found that the list of substances that may be proved to undergo chemical decomposition by light, was very extensive, some of the most active being the ferro- and ferri-cyanides of potassium and the nitroprusside of sodium, tartrate of uranium and a mixture of selenious and sulphurous acids in presence of hydrochloric acid. The complete paper does not appear to have been published.

In 1876, M. Egoroff published a note (*Comptes Rendus, Acad. Franc.*, LXXXII, 1876) on a differential electro-actinometer for the purpose of determining the absorption of the ultra-violet rays by different media. The instrument consisted of two of Becquerel's electro-actinometers placed one above the other and arranged so that the current of one might be neutralised by the other. In some preliminary observations with iodised silver plates he found that the intensity of the current was proportional to the width of the opening through which

light was admitted. It was also inversely proportional to the square of the distance of the source of light from the apparatus. An oil lamp was used. The instrument appeared to show an exact proportionality between the intensity of the light and that of the current, and its great sensitiveness and precision would enable it to be used as a very delicate photometer. In these experiments he found that the electromotive force exerted by the November sun upon iodised silver plates through an opening 30 mm. wide was $\frac{1}{15}$ of a Daniell cell; with a petroleum lamp, at 8 inches distance, it was only 0·004 Daniell.

Dr. J. Moser afterwards, in 1887, in working on Egoroff's plan found that the photo-electric current might be greatly increased by treating the chlorised, iodised or bromised silver plates with solutions of erythrosin, benzo-purpurin and other dyes, and in sunlight he observed currents of a strength equal to half a volt (Eder's *Jahrbuch der Photographie, &c.*, 1888, p. 297.)

At the meeting of the British Association, in 1880, Professor G. M. Minchin gave an account of his experiments on the generation of electric currents by the action of light on silver plates which were coated with emulsions of bromide, chloride, iodide and other salts of silver in gelatine and collodion, as well as with eosine, fluorescine and various aniline dyes, the object of these experiments being the solution of the problem of producing a photographic image of an object at a distance. A detailed account of these and other interesting experiments on light-cells was read before the Physical Society and published in the *Philosophical Magazine*, for March 1891.

He found that when two pieces of clean silver foil attached to glass plates were coated with an emulsion of chloride of silver in collodion and immersed in distilled water containing a few grains of common salt, the plates being connected with the terminals of a Thomson's galvanometer and one of them screened from the light, that on exposing the unscreened plate there was an electric current produced and the exposed plate was *negative* to the unexposed. The same effect was observed with plates coated with emulsions of silver bromide in water containing a little potassium bromide. When the plates were coated with iodide of silver in collodion by the wet silver-bath method, the liquid being water containing a little potassium iodide, there was a reversal of the nature of the exposed plate, it being *positive* to the unexposed. With coloured glasses in front of the exposed plates it was found that the red rays produced comparatively feeble currents, while those produced in the blue and violet rays were very great, but the directions of the current were the same for all rays. This agrees with Becquerel's observations. With plates coated with

an emulsion of silver sulphide in potassic sulphate, the exposed plate was *positive*, the direction of the currents being the same for all rays, the strength of the current being least for the rays passing through the green glass.

With plates coated with an emulsion of silver nitrate in gelatine in a weak solution of barium nitrate the exposed plate was *positive*. The effect of the red rays was very small, and of the blue rays very great.

One of the most important points in Professor Minchin's observations is his discovery of the formation of an invisible developable deposit on silver plates coated with an emulsion of silver bromide, by the action of the electrical current from a single bichromate cell passing through the plates when immersed in water containing a little potassium bromide. He found (1) that the plate connected with the carbon pole, the cathode, was without the employment of any developer visibly blackened in its immersed part, (2) that no visible change took place on the other plate attached to the zinc, but when the plate was developed with an ordinary pyrogallic acid developer its immersed portion was also blackened. These effects were entirely due to the passage of the current and were strictly confined to those portions of the sensitive plate through which the current passed.

The special bearing of these observations upon the formation and composition of the invisible or visible developable photographic image formed by the action of light, does not appear to have been generally recognised. I began last year a series of observations on this subject which quite confirmed Professor Minchin's: unfortunately they were interrupted before completion, but I hope to resume them in due course, after the completion of the present series, and bring them before the Society on a future occasion.

Professor Minchin also found that by coating silver plates with eosine and gelatine, comparatively strong currents were obtained and the plates were very sensitive to variations in the light. The current generated by daylight in one of these eosine cells was sufficiently strong to produce the photographic action on a silver bromide plate without any preliminary exposure of the bromide plate to gaslight. He also describes a curious case of inversion of the current occurring in the eosine and other cells, which I have also noticed, the initial current being such as to make the exposed plate *positive* to the other. This current, however, was of very short duration and was succeeded by a steady and much stronger normal current in the opposite direction, the exposed plate being *negative* to the unexposed. On suddenly shutting off the light from the plate the instantaneous effect was to

increase the existing current, the effect being merely impulsive, after which the current generally disappeared. This cell having been kept in the dark for a fortnight, it was found that while the inverse currents were produced as before, the initial current on exposure was enormously increased in magnitude and duration. It then disappeared gradually and was succeeded by a current in the reverse direction. When one of these plates was removed from the cell and immersed in water in presence of a clean silver plate, it was at once on exposure to light *negative*, like a silver plate coated in the ordinary way with an emulsion of eosine. In preparing these eosine-gelatine films, it was found to be an advantage to immerse them for a few minutes in a strong solution of alum in order to prevent the dye from washing out of the film too readily.

With silver plates coated with napthalene red and gelatine the effects were not so strong as with eosine; the exposed plate was *positive* and with strong red rays there appeared to be a reversal of the sign of the E. M. F.

Plates coated with iodine green and exposed to sunshine gave currents with an E. M. F. amounting to about $\frac{1}{20}$ volt.

M. F. Griveaux, experimenting on silver plates coated with a film of silver iodide, plunged into solutions of iodine of different strengths, circulating through the cell, found that the maximum value of the E. M. F. developed by light acting on one of the plates decreased as the strength of the iodine solution increased, till a certain point was reached at and above which the E. M. F. was *nil*. Also that this point was regulated by the distance of the plates from the source of light; the nearer the plates the higher the concentration point of the solution and *vice versâ*. The same effects were observed with silver chloride and bromide. (*Comptes Rendus Acad. Franc.*, CVII, 1888, p. 837.)

I have entered somewhat fully into these previous experiments because very little appears to be generally known about the subject and it seemed desirable to bring together the scattered observations.

In carrying out my experiments I have used two kinds of cells, one horizontal and one vertical, more usually the latter. It consists of a glass cell in which the plates can be coupled face to face or back to back, one being screened from light by the other and by one or two interposed screens of ruby or yellow glass, the cell being covered all round except at an opening on one side. This glass cell is enclosed in a wooden box with a shutter on one side sliding in front of an opening about 1·5″ × ·5″, corresponding to the one in the glass cell. In front of this shutter there are grooves in which coloured glasses can

be placed in front of the opening. The upper part of the wooden case is open, but can be closed by a lid, through which, if necessary, a funnel may be passed to admit of solutions being poured into the cell without letting in light. The silver plates used with this cell are 4 inches long, and $1\frac{1}{4}$ inches wide, other plates, such as photographic sensitive dry plates or celluloid films, being about the same size or smaller.

The other cell is a modification of the form used by Becquerel in his earlier experiments, and consists of a wooden trough divided into two compartments by a double wooden screen which allows the free circulation of the electrolytic fluid, while completely shutting off light from the unexposed compartment. This trough is covered with a lid, having two large openings fitted with hinged shutters, to the underside of which mirrors are attached for the purpose of reflecting light at will on to one or other of the sensitive surfaces in the compartments below. By this arrangement the whole of the sensitive plate can be exposed to light, instead of only part of it, as in the vertical cell, and at the same time the perfect protection of the unexposed plate from strong light is better secured than it is in the vertical cell. This horizontal trough is constructed to take two plates $3\frac{1}{4}'' \times 4\frac{1}{4}''$ or smaller.

In most cases, even under favourable conditions, the light-currents observed, are exceedingly weak, and therefore a very sensitive form of galvanometer is necessary. The one I have used is the latest modification of the Rosenthal micro-galvanometer made by Edelmann, in Munich. It is said to be the most sensitive form of galvanometer made, enabling currents of about a billionth of an ampère to be read with a resistance in the coils of only 1,000 ohms. It is fitted with a telescope by which direct readings are made off the mirror from a millimetre scale placed at one metre from it. In this position and without the directing magnet, using the $\frac{1}{1000}$ shunt, with a total external resistance of about 60,000 ohms in circuit, the deflection caused by one gravity-Daniell cell is one millimetre division of the scale. By using the directing magnet the normal sensitiveness of the instrument can be very greatly increased, though in most of the experiments it has been found sufficiently sensitive without the magnet, and when used, the increase of sensitiveness has been limited to about five times the normal. The instrument can be set up in any position, is simple in construction and I find it very sensitive, convenient in use and easy to observe with fair precision, considering the difficulty there is in obtaining freedom from shake and tremor in a city like Calcutta built on a bad foundation of mud. In reading the scale which is 50 centimetres long,

sub-divided into millimetres, I have usually fixed the zero point at 30, so that the readings above or below it may as far as possible show different signs of E. M. F., and the direction of the currents has been so arranged that a change in the position of the index to the apparent left from 30 to 0 shall indicate that the exposed plate is *negative* to the unexposed, as copper to zinc, while a change to the apparent right, 30 to 50, shows that it is *positive*, or as zinc to copper.

The coloured glasses used have been of the kinds ordinarily met with in the bazar. A deep ruby, a brownish yellow, a medium green, and a dark blue, and conditions being favourable it has generally been possible to observe some trace of a current even with the deep ruby in strong sunshine.

When observations were made with the spectroscope, whether with a Rowland's diffraction grating or prisms, it was found that the amount of light admitted through the slit for ordinary work, was quite inadequate, even when the slit was open at its widest; and it was therefore necessary, in most cases, to use a much wider slit, or to dispense with its use altogether; also to use the directing magnet on the galvanometer to increase the sensitiveness.

In all cases sunshine has been reflected on to the sensitive plates by means of a heliostat, as it was not convenient to use the direct rays of the sun. With the flat cell there were thus two reflections, but any loss of light was amply made up by the increased surface exposed.

As is usual in such experiments, there were almost invariably more or less strong local or polarisation currents generated between the plates themselves, especially when they were freshly immersed in the solutions, and it was generally found desirable to leave the cell from 12 to 24 hours before use, so as to give time for these currents to subside. Sometimes, however, from half an hour to an hour, or even in some cases a few minutes is sufficient. It was found, too, that even if there was no polarisation current at the commencement of an experiment, the action of light occasionally gave rise to fairly strong currents quite independent of, and sometimes opposed to, the currents produced by exposure to sunshine, while at others they were in the same direction. Thus it was sometimes difficult to ascertain how far the currents observed were due to light or to polarisation. The only test was the retrograde movement of the needle after shutting off the light.

Another difficulty in making these observations may be noted, and that is, the apparent reversals of current which are due in many cases to decrease in the strength of the light, though the decrease may be almost imperceptible. For the same reason, if coloured glasses be applied without first completely shutting off the light after the plates

have been exposed to sunshine, there is an apparent reversal due to the loss of power in the light, and not to change of direction of the E. M. F. As a rule my observations with coloured glasses or the spectrum have agreed with Becquerel's and Minchin's that no reversal of sign is produced by any of the coloured rays. At the same time, I have found that in some cases the blue rays appear to have a reversing tendency, as might be anticipated from their very strong reversing action on certain forms of sensitive photographic plates containing iodide or bromo-iodide of silver. This point, however, requires much more complete investigation with the aid of the spectroscope, and will be further considered when dealing with the silver haloids. During the time I have been engaged with these observations, the weather has been unusually changeable and cloudy for the time of year, and hence it has been difficult to compare the results of observations on different days. For this reason it has been impossible to give more than general indications of the amount of deflection caused by the action of light in the cases recorded: exact observations would have to be made with a standard light.

It seemed desirable to commence the observations with experiments on plain silver plates in different fluids. The plates used were not quite pure, having been reduced from various silver residues, and were about ·974 touch. They were four inches long and one and a quarter inch wide, and were usually cleaned with fine emery powder, or with emery cloth immediately before and after use. It is, however, better to make sure of the purity and cleanliness of the surface of the plates for each operation by heating them red-hot and then immersing them in dilute sulphuric acid. As facilities for doing this with thick plates were not readily available, it has been omitted in all the following observations. As a rule, the plates were immersed in the solutions to a depth of from 2 to $2\frac{1}{2}$ inches, care being taken to avoid moistening the upper unimmersed parts by capillary action or otherwise, and so exposing them to irregular currents from this cause. The plates were about half an inch apart, being kept separated by two wooden blocks with a dark ruby glass plate between them.

I. Silver Plates in Water.

Distilled Water.

Distilled water being almost a nonconductor, the currents observed were naturally exceedingly weak and could only be clearly seen with strong sunshine. The deflection observed without the magnet varied from ·5 to 3 divisions of the scale, and in nearly all cases the exposed plate was positive to the unexposed, and formed the anode or dissolving plate of the couple. In some cases the exposed plate became more

sensitive after the first exposure, but after a few exposures lost all sensitiveness. The current being so small, it was not thought necessary to experiment with coloured glass or the spectrum. With the directing magnet placed as before described the deflection was increased to about 6·5 divisions.

Tap Water.

The tap water used was the filtered Hooghly water, supplied in the town mains. It is fairly pure and free from lime salts, but chlorides are present in moderately large proportion, the amount of chlorine varying from ·5 to 1·4 parts per 100,000, and at the time of the experiments it would be about 1 to 1·2 parts per 100,000. The total hardness varies from 3·15 to 11·5 parts and would be about 9 parts per 100,000 at the time of the experiments. In most of the cases observed the exposed plate was distinctly positive to the unexposed, as with distilled water; but in some cases it was negative, and in one or two instances the action was irregular. The plates were rather more sensitive than they were in distilled water, the normal deflections without the directing magnet varying from 1 to 7 divisions of the scale, but usually they were between 2 and 4.

In one case in which the plates had been in the cell for about 38 hours, and there was only a very slight cell-current, exposure to sunshine gave a deflection of + 4·5 divisions without the magnet, but with it the deflection in bright sunshine rose to + 20 divisions, and even in diffused light was + 5 divisions. Exposing under ruby glass gave a deflection of + ·5; yellow glass + ·7; green glass + 1; blue glass + ·5 in diffused light, and + 7·5 in sunshine. Trials were also made with the grating spectroscope without the directing magnet, but the results were not conclusive and the unsettled weather has, so far, prevented their being repeated with the galvanometer in its most sensitive state. The plates were found very sensitive to changes in the strength of the light, but after repeated exposure to sunshine they seeemed to lose sensitiveness. By the action of the water a greyish deposit of chloride was formed and in some cases a darkened image of the exposed part of the plate could be seen. It may be noted that my experience does not agree generally with that of Hankel, who found that, of two silver plates immersed in water the plate exposed to white clouds, or to the setting sun, was negative. I find, however, that on one occasion when fresh plates were exposed to daylight, the exposed plate was negative, the deflection being about − 1·5 divisions of the scale. On again exposing the same plates to sunshine the exposed plate was positive, and remained so afterwards on further exposure. On two other occasions of expo-

sure to daylight, the exposed plate was also negative. When exposed to sunshine the plates were almost invariably positive. I have noticed this difference with plates in other solutions.

II. Silver plates in dilute Acids.

As we have seen above, Becquerel found that with plates of gold or platinum, immersed in acid solutions, the plate exposed to the light was always positive. The same rule seems to apply to silver plates in most cases, but not in all.

Dilute Sulphuric Acid.

The action of dilute sulphuric acid upon silver plates under the influence of light seems to be rather irregular, but I find on looking through all the experiments made, that in nearly all cases the first exposed plate of each pair had a negative tendency when first exposed, though it might become positive by subsequent exposures and in the same way the second plate of the pair, which was screened during the first exposure, might also be positive on first exposure. The general tendency was undoubtedly positive. The irregularities may be partly due to the plates not being quite pure.

With silver plates immersed in distilled water acidified with about a drop of acid in some 60 cc. of water, the exposed plate was generally positive when exposed to bright sunlight, the deflection without the directing magnet varying from 1 to 4·5 divisions of the scale, sometimes increasing after repeated exposures. In one experiment, however, the exposed plate was distinctly and uniformly negative, even after the position of the plates had been reversed, but subsequent exposure of the reversed plate made it positive. In another it was negative on first exposure and then positive.

With a pair of plates in tap water, acidified in the same way, the plate exposed to sunshine was first negative with a deflection of -3 divisions on the scale, which increased to -6 divisions by subsequent exposures. Exposure under coloured glasses also gave a negative deflection, amounting with red glass to -1, with yellow and green glasses to -2; with blue glass to -5, and exposed to sunshine again -6, as before. The same plates being again exposed to sunshine later on were also negative at first, but became positive and much more sensitive. Under coloured glasses the deflections were also positive and very much larger than on the first exposure of the plate. After reversal, so that the former unexposed plate became the exposed plate, the deflection was again negative, amounting to -7 divisions, and increasing with the exposure. These plates were very sensitive to changes in

light, and there was a perceptible deposit of chloride (?) on their immersed surfaces.

With plates immersed in a 1 per cent. solution of sulphuric acid in distilled water, it was found that if the plates were exposed to sunshine a very short time after being immersed in the dilute acid, they were at first negative and fairly sensitive to light but afterwards became positive; whereas in a case when the plates were left standing for 24 hours to reduce the polarisation, they were positive, and much less sensitive than the plates which were negative. After a short time they seemed to lose all sensitiveness.

In tap water containing the same proportion of acid, the exposed plates were generally positive on opening the shutter; but the current quickly decreased, and with some plates after several exposures they gave a negative deflection.

With plates immersed in distilled water containing two per cent. of acid the deflections were usually positive and the plates seemed to become less sensitive by repeated exposure and by keeping.

With plates immersed in dilute acid at 5 per cent., which had been allowed to stand for 24 hours, and showed a very small cell-current, the first plate of the pair was distinctly negative when exposed, the deflection being -4, decreasing with exposure to -2, but the second plate when exposed after reversal of the plates in the cell was positive with a deflection of $+6$. Two other pairs of plates in freshly-mixed acid were positive on first and subsequent exposures. The addition of acid lowered the sensitiveness of the plates considerably.

All the plates showed a slight grey deposit or stain on the immersed ends, but no trace of an image.

Dilute Nitric Acid.

With nitric acid the exposed plates are nearly always positive and the action is far more uniform than with sulphuric acid, especially when an appreciable quantity of acid, as one per cent. and over, is used. Becquerel also found the exposed silver plate positive in dilute nitric acid.

With distilled water acidified with about 1 drop of acid in 70 cc., the exposed plate was positive on first exposure, but afterwards became negative. The plates were not very sensitive, the deflections without the directing magnet varying from 1 to 3 divisions of the scale.

With 1 per cent. of nitric acid, *sp. g.* 1·250, in distilled water, after 14 hours standing, the exposed plate was uniformly positive, and more sensitive than with the acidulated water, the deflections in sunshine being from 3·5 to 5·5 divisions, without the directing magnet. There

was a slight greyish deposit on the plates, but no image on the exposed part.

With three per cent. of the same acid in distilled water, after 22 hours standing, the first plate exposed in weak sunshine first showed a negative deflection of 2 divisions, and after that was positive, the deflection of repeated exposures being steadily about + 5 divisions, without the magnet. With the directing magnet, the deflection was about + 20 divisions with the 100 ohm, or $\frac{1}{10}$, shunt.

After the experiment the solution was found to contain silver.

Dilute Phosphoric Acid.

With dilute phosphoric acid the deflections were almost always positive. Plates freshly immersed in a mixture containing 1 per cent. of the acid, sp.g.1·750, in distilled water and exposed to sunshine, gave an initial deflection, without the magnet, of + 23 divisions, but this quickly decreased with further exposure. After shutting off the light the cell-current was found to have increased, and on again opening to sunshine the deflection seemed slightly negative, but the action generally was irregular. Subsequent exposures with the same cells or after the plates had been reversed showed positive deflection and the plates were less sensitive than at first.

With the same acid at 5 per cent. the deflections were uniformly positive. With plates exposed to sunshine after 16 hours, the deflection without the magnet was + 8 divisions, but, as in the former case, it was less on subsequent exposure. The same decrease of sensitiveness after exposure was noticed with the plates after reversal in the cell.

Dilute Hydrochloric Acid.

With 1 per cent. of hydrochloric acid, *sp. g.* 1·150, in distilled water, the exposed plates have shewn themselves uniformly positive, and owing to the formation of a deposit of chloride they are much more sensitive to light, than are plates immersed in acids which do not form a sensitive compound with the silver. The deflections with sunshine, without the directing magnet, were from + 6 or + 7, when the plates were first exposed, to + 36, when they had been kept for some hours longer and then exposed. The plates were covered with a greyish deposit of chloride on the immersed parts, and there was a distinct darkened image on the part of the plate exposed to light. Coloured glasses all gave positive deflections, the red being the smallest, and then the green.

With 3 per cent. acid, after 22 hours resting, the plates exposed to sunshine were positive. The increase of acid seemed to reduce the sen-

sitiveness very much, the highest deflection in sunshine, without the directing magnet, being + 16, while after the plates had stood for 37 hours it was only + 11.

There was a dark grey deposit of chloride on the immersed parts of the plates, which took a violet or purple colour on exposure to light, and gave off an odour of chlorine.

Dilute Hydrobromic Acid.

With dilute hydrobromic acid containing 10 cc. of the ordinary pharmaceutical dilute acid, of 10 per cent., to 100 cc. distilled water, the plate exposed to sunshine or diffused daylight was uniformly *negative* and extremely sensitive to light, the first deflection in bright sunshine being about − 187 divisions, without the directing magnet, decreasing to a steady reading of about 140 divisions. Even coloured glasses gave fairly large deflections; red, − 13; yellow, − 54; green, − 64; blue, − 103.

With dilute acid of double the above strength, the exposed plate was also uniformly negative, but the plates did not seem so sensitive, the deflection in sunshine, without the magnet, being only − 82; but the readings depend very much on the strength of the light, and this was variable at the time of observing.

In both these cases the plates were coated with a grey-greenish-yellow deposit of bromide, which turned dark on exposure, and formed a visible image of the exposed part of the plate.

Dilute Hydriodic Acid.

As pure hydriodic acid is somewhat troublesome to prepare, I roughly made up a solution of it by precipitating one gramme of barium iodide, dissolved in water, with sulphuric acid and adding water to make up 100 c.c. There was, however, a considerable quantity of free iodine present, the solution being of a light sherry colour.

The cell containing two clean silver plates immersed in this solution was left standing for 15 hours. The plate exposed to sunshine was then found strongly negative, the deflection, without the directing magnet, being − 110 divisions of the scale, afterwards going up to − 130 divisions. The plate was, very insensitive to weak daylight, the reading being only 12 divisions when the sun was hidden behind clouds. With coloured glasses fairly large deflections were obtained, always in the same negative direction; red glass giving − 15 with daylight, and − 16 with sunlight; yellow − 16·5 with daylight, and − 20 with sun; green − 14 with daylight, and − 19 with sun; blue − 16 with daylight, and − 80 with sun. By keeping, the plates

became less sensitive. They were covered with a strong loose deposit of iodide, under which the silver surface was darkened. A faint image of the exposed part was visible.

Dilute Glacial Acetic Acid.

With plates freshly immersed in dilute glacial acetic acid of 1 per cent., the plate exposed to sunshine was positive, the deflection being about + 6·5 divisions, without the magnet; a second exposure gave a deflection of + 8·3 divisions. By keeping for 24 hours the plates were less sensitive, but remained positive.

Plates immersed in dilute acid of 5 per cent. and kept 24 hours before exposure were less sensitive than the above, the deflection with sunshine being only + 3 divisions without the magnet, and they became less sensitive by further exposure, but were always positive.

Dilute Formic Acid.

The only other organic acid I have yet tried is formic acid, one per cent. in distilled water. After the cell had been standing 24 hours, exposure to sunshine gave a deflection amounting to about 8 divisions, the exposed plate being positive. The same plates after another 24 hours standing were found to have become very insensitive, the deflection being only one or two divisions of the scale, the exposed plate still being positive.

III. Silver plates in Alkaline Solutions.

Becquerel found that when platinum or gold plates were immersed in alkaline solutions, the plate exposed to light was negative. So far as my experience goes, this rule does not hold good with silver, the sign of the exposed plate being almost always positive. I have not tried these solutions very thoroughly, but the results obtained with potash and other salts used seem conclusive.

Solution of Potassium Hydroxide.

With a solution of one per cent. of caustic potash in distilled water, the cell having been standing 22 hours, the cell current was *nil.*

Exposure to bright sunshine gave a deflection of about 9·5 divisions without the magnet, the exposed plate being positive. With the magnet the deflection was about + 45 divisions in sunshine, and + 9 divisions in daylight. With sunshine under blue glass the deflection, with the magnet, was + 31; under green + 9; yellow + 8; red + 4·5. There was no deposit on the plates and no image of the exposed parts.

Solution of Potassium Carbonate.

With a solution of one per cent. of anhydrous potassium carbonate, the cell having been standing for about 14 or 15 hours, the cell-current was very small, and the plate exposed to light, either daylight or sunshine, was found to be positive, the deflection in the former case being + 22, and in the latter + 63·5, without the magnet.

With tap water made alkaline with a few drops of ten per cent. solution of the carbonate in about 60 c. c. of water, the exposed plates were also positive and very sensitive on first exposure, but the current decreased with further action of light, and in subsequent exposures the plates were less sensitive to light. They also lost sensitiveness by being kept in the cell.

Solutions of Sodium Carbonate.

With silver plates exposed shortly after immersion in 1 per cent. solution of anhydrous sodium carbonate in distilled water, the plate exposed to sunshine was positive, the deflection being about + 5 divisions without the magnet. In subsequent exposures the plates were less sensitive, but remained positive.

With a stronger solution, at 5 per cent., the results were similar, but the plates seemed somewhat more sensitive.

Solution of Lithium Carbonate.

With plates exposed shortly after immersion in a 1 per cent. solution of lithium carbonate in distilled water, the plate exposed to sunshine was positive, the deflection being about + 6 divisions without the magnet. The plates lost sensitiveness after the first exposure as well as by keeping for 34 hours, but remained positive.

Dilute Solution of Ammonia.

With a solution of 4 c. c. of strong liquid ammonia in 100 c. c. distilled water, the cell having been left standing some 14 or 15 hours, the plates were found to be exceedingly insensitive to light; even with the magnet the deflections in sunshine were only about 2 divisions, the exposed plates being positive.

Another pair of plates immersed in a freshly-mixed solution, containing 2 c. c. of liquid ammonia in 100 c. c. of water, and exposed soon after immersion, were also found insensitive, but not so much so as the last; the deflection on first exposure in sunshine being about 3 divisions, without the magnet. The current, however, decreased on further exposure, and the same effect was observed in subsequent exposures. After a short time no current was perceptible.

The immersed parts of the plates showed no deposit.

Potassium Cyanide.

With a solution of potassium cyanide in distilled water, about 1 per cent., there was a strong negative polarisation current in the cell when first prepared, which took several hours to subside. When freshly immersed the exposed plate was negative, but not very sensitive, the deflection without the magnet being only − 4 divisions for sunlight. By keeping the cell 24 hours the polarisation current subsided entirely, and the plate exposed to sunshine was again negative with a deflection of − 3·5 divisions. A slight movement of the cell, however, seemed to cause a reversal of the current with a deflection of + 6·5 divisions which further continued for another 6·5 divisions after the light had been shut off. The same effect was observed on subsequent exposures, first the plate was negative then positive, while the polarisation current increased in the same direction. After a time the plate seemed to become quite insensitive to light.

With the same plates reversed there was again a very large initial negative polarisation current. On first exposure of a plate to sunshine the deflection was − 14·4 divisions, without the magnet. On shutting off the light, the negative polarisation current was found to have very largely increased. On second exposure the plate was first negative and then positive. On shutting off the light the current continued + 2·5 divisions in the same direction and then turned back in its original direction. The plates were coated with a dark grey deposit, thicker at the upper part of the plates than at the lower. About the immersion line there was a yellowish-white deposit, and the plates were deeply corroded, but no sign of an image of the exposed part was visible.

From the above experiments it would appear that as a general rule sunlight has an oxidising or dissolving effect on silver, whether in acid or alkaline solutions, the exposed plates being nearly always positive and consequently forming the anode of the voltaic couple. With solutions decomposed by silver and forming sensitive compounds the action is variable.

IV. Plain Silver plates dry.

When a comparatively large silver plate about 5 × 4 inches, not immersed in any solution, but with its ends connected by silver bands to the terminals of the galvanometer, the directing magnet being specially placed so as to increase the normal sensitiveness about 13 times, was exposed to light so that the upper half remained unexposed, it was found possible to detect a slight current between the exposed and unexposed halves of the plate; the exposed half being positive to the unexposed. With an uncleaned plate that had lain in a drawer for

some months, the deflection in sunshine was fairly large, amounting to about 10 divisions, or rather more than the deflection caused by the contact of dry zinc and copper. When, however, the same plate had been carefully cleaned with a solution of cyanide of potassium followed by the usual rubbing with emery cloth, the deflection was found to be still positive, but much smaller, being only about 1·5 divisions on first exposure, and by repeated exposure it was reduced to about ·25 division.

With subsequent exposures the deflection was generally in the same direction, but once, after fresh cleaning, it was negative. With a plate of pure silver deposited on glass, freshly polished, the first exposure gave after a short interval, a fairly strong negative deflection, but with subsequent exposures at intervals the deflections have been sometimes negative and sometimes positive, but always very small, so that the observations are somewhat uncertain. Plates of almost perfectly pure silver, 999·5 touch, obtained through the kindness of the Mint Master, Lt. Col. Baird, R. E., F. R. S., gave also rather indefinite results, owing to the smallness of the currents, and though the deflections were generally positive on first exposure of the plates, they were sometimes negative, or became so by prolonged exposure. The general tendency, however, appeared for the plates to be positive under the influence of light, and, if this is the case it would seem to point to some slight oxidising action on the surface. At the same time, the results obtained with *pure* silver and the fact that in so many cases the deflections have been first positive and then negative, appear to favour the conclusion that such plates are really negative. It was clearly ascertained that the currents produced were not due to the action of heat, because with the plate first observed and with the purest silver plates, the action of heat applied at the exposed end of the plate was to give a positive deflection, but with the less pure silver plates used in the cells and others largely alloyed with copper, the heated end of the plate was always negative to the cool end. The deflection invariably increased with the continuance of the heating, and was always in the same direction on repetition of it.

The light currents, on the other hand, showed a decrease of deflection from repeated exposures and sometimes a change of sign in a direction contrary to the heat currents shown by the same plates. The observation is rather a difficult one and requires further repetition under more favourable conditions of light, in order to obtain definite results.

I have also tried the effect of solutions of alkaline haloid salts upon silver plates, but as this paper is already beyond the usual limits, it may be well to defer the account of these and other experiments on photographic plates containing the haloid salts of silver to a future paper.

Noviciæ Indicæ VI. *A review of the genus* Colquhounia.—*By* D. Prain.

[Read May 3rd.]

Writing in 1885 (*Flora of British India*, iv, 674) Sir Joseph Hooker had to say of this genus:—"I am quite unable to distinguish the first three species,* or to reconcile their specimens, descriptions and published drawings with one another." And in 1890, when engaged in arranging the Calcutta Herbarium material of the natural order Labiatæ to which the genus belongs,† the writer, after considerable study came to the same conclusion. Since then, however, the opening up of the hill-country to the east of the Irrawaday has enabled the Calcutta Herbarium to send native collectors into hitherto unknown portions of the Shan Hills. One result has been the communication of suites of specimens that have helped to clear up some of the doubtful points. Briefly stated, the result of a renewed study has been that there seems to be no necessity for recognising more than two species in the genus; both these species are, however, very variable, and include between them seven more or less distinguishable and definable forms. The present paper consists of a short bibliographical review of these with diagnoses of all of them, and with an account of their distribution appended.

The genus Colquhounia was founded by Wallich in 1822,‡ on specimens collected by himself in Nepal, in honour of his friend Sir Robert Colquhoun, Bart., of the H. C.'s service. His diagnosis, and voluminous description of *Colquhounia coccinea*, the species then proposed, he republished, practically unaltered, two years later,§ giving at the same time a coloured plate which represents however, not the typical plant originally described, but a variety with smaller flowers. In a note at the end of this second description, Wallich distinguishes by name and by a general diagnosis a second species, *C. vestita*. This, he says, comes from various localities in Nepal, at a higher elevation than the stations for *C. coccinea*, and occurs also in Kamaon. He says that *C. vestita* flowers in the height of the rains, *C. coccinea* at the end of the rains and in the cold weather; the main distinction given, however, is one of tomentum; this is described as being in *C. coccinea* scaly-stellate, rusty, dense and friable, in *C. vestita* soft, white, thick and separable.|| The flower-spikes and flowers are admitted to be similar; plainly therefore the distinction is not a far-reaching one.

* *Colquhounia coccinea* Wall., *C. vestita* Wall., *C. elegans* Wall.

† *Journ. As. Soc. Bengal*, lix, 2, 294.

‡ *Trans. Linn. Soc.*, xiii, 608.

§ *Tent. Flor. Nap.*, i, 12 t. 6.

|| *Tent. Flor Nap.*, i, 14.

The Labiatæ of the H. E. I. Company's Herbarium were distributed by Wallich in 1829;* Bentham, who revised for Wallich the naming of this particular order, treated these two species somewhat differently. In *C. coccinea* he recognized three distinct forms:—†

(1). *C. coccinea* proper; the pink-flowered plant originally described in *Trans. Linn. Soc.*, and re-described in *Tent. Flor. Nap.*

(2). var. *β. major* Benth.; the Nepalese plant from higher levels and with denser tomentum, treated by Wallich as identical with the plant from Kamaon that he distinguished specifically from *C. coccinea*.

(3). var. *γ. parviflora* Benth.; an orange-flowered plant, not clearly differentiated by Wallich in either of his descriptions, but figured by him in the *Tentamen* as typical *C. coccinea*.

On the other hand the name *C. vestita* was strictly limited to the plant from Kamaon already referred to, which had been communicated to Wallich by Blinkworth,‡ and a new species from Burma, *C. elegans*, was for the first time mentioned.§ In the same year Bentham in another place defined the genus, mentioning all three species, but not there distinguishing the varieties of *C. coccinea*.||

In 1832 Wallich again dealt with these *Colquhounias*, figuring both *C. vestita* and *C. elegans*.¶ He diagnosed *C. vestita* from *C. coccinea* by its "ovate-oblong much attenuate acuminate leaves, very densely hoary tomentose below, as are the branches," adding that this character comprises all the points in which *C. vestita* differs from *C. coccinea*. From the original specimens it is evident that this figure of *C. vestita* was taken from one of Blinkworth's Kamaon specimens; Wallich did not however adopt Bentham's limitation of *C. vestita* to that locality, for he replaced in the species the Nepalese plant that forms Bentham's *C. coccinea* var. *major*. In immediate sequence come the definition and figure of *C. elegans*, the Burmese species; of this he mentions having only seen one shrub; the best distinction, Wallich says, between this and *C. coccinea*, which it much resembles, is the colour of the flowers—orange, dotted with crimson specks, instead of red. The plant is described as having leaves very softly tomentose on both surfaces, an idea

* *Lith. Cat.* n. 2084—6.

† *Wall. Lith. Cat.* n. 2085/1, 2085/β, 2085/γ.

‡ *Wall. Lith. Cat.* n. 2086.

§ *Wall. Lith. Cat.* n. 2084.

|| *Bentham, Synops. Labiat.* in *Bot. Reg.*, xv, sub 1292.

¶ *Plant. As. Rar.*, iii, 43, tt. 267, 268.

by no means conveyed by the figure, which represents a plant that, as Sir Joseph Hooker says,* cannot be distinguished from *C. coccinea* VAR. *parviflora*. These two plants are however remarkably dissimilar in tomentum, the hairs being stellate in VAR. *parviflora*, as they are in all the other forms of *C. coccinea*, but simple in *C. elegans*. As regards the *degree* of tomentum of *C. elegans* it is the description that is accurate, the figure that is misleading.

In 1834 Bentham again dealt with the genus†, and on this occasion still confined *C. vestita* to the Kamaon plant of Blinkworth, though in *C. coccinea* he now recognized only two forms:—

(1). *C. coccinea* proper, which now includes the original plant described by Wallich, as well as the Nepalese portion of Wallich's *C. vestita;* this variety therefore now includes the original *C. coccinea* and Bentham's own *C. coccinea* VAR. *major*.

(2). VAR. *β. parviflora* Benth., which is the same as the plant so named in 1829.

The Burmese *C. elegans* is defined in the Wallichian sense.

In 1848 Bentham‡ followed in the main his treatment of 1834, but as regards *C. coccinea* confined the Wallichian number 2085 to VAR. *parviflora* alone, although, as we have just seen, this number applies *in the Catalogue* to every specimen of *Colquhounia* collected in Nepal. Under *C. vestita* also Bentham diverged somewhat from his previous treatment by admitting into the species a plant sent by Griffith from Assam. This is, however, a plant that must be kept specifically apart from *C. vestita* if *C. vestita* deserves to be held specifically distinct from *C. coccinea;* while, even if *C. vestita* and *C. coccinea* be conspecific, this Assam plant is still varietally distinct from both.

In 1850 Sir William Hooker figured§ as *C. coccinea* a plant raised at Kew from seed sent by Wallich from Nepal. This is the plant originally figured by Wallich in the *Tentamen*, and therefore is not exactly the one originally described by him there and in the Linnean Society's *Transactions;* it is not typical *C. coccinea*, but is Bentham's *C. coccinea* VAR. *parviflora*.

In 1851 Schlechtendal described‖ as *C. mollis* a plant whose origin he was unable precisely to trace. His description is, however, so full

* *Flora of British India*, iv, 674.
† *Labiat. Gen. & Sp* 644.
‡ *DC. Prodr.*, ii, 457.
§ *Bot. Mag.*, lxxvi, t. 4514.
‖ *Linnaea*, viii, 681.

and clear as to leave no room for doubt that his plant is identical with the Assam one referred by Bentham to *C. vestita*.*

In 1873 Houllet figured as *C. tomentosa*† what appears to be the same plant.

In 1876 Bentham and Hooker speak of the possible existence of a fourth species‡; it is not clear whether by this fourth species be meant Schlechtendal's *C. mollis*, which is cited indirectly through a reference in Walpers; or a Burmese plant collected by Mason, Parish, Anderson and Kurz since published as *C. tenuiflora* Hook. f.§ but which in 1877 Kurz‖ described as *C. elegans*. Kurz wrote under the disadvantage of only knowing Wallich's plant from the figure which Wallich gives of it; that figure, as has already been said, is quite misleading.

The next account to be noticed is the most important of all—that by Sir Joseph Hooker in the *Flora of British India*. Here four species are described:—

1. *C. coccinea* Wall.; with Bentham's VAR. *parviflora* excluded.
2. *C. vestita* Wall.; limited, in the sense adopted by Bentham in 1848, to the Kamaon plant of Wallich and the Griffithian plant from Assam,¶—the Nepal plant originally included in *C. vestita* being excluded and Schlechtendal's *C. mollis* not being referred to; the identity of *C. vestita* as a whole with typical *C. coccinea* is suggested.
3. *C. elegans* Wall.; limited to the original Wallichian plant from the Taong Doung Mts; its identity with *C. coccinea* VAR. *parviflora* Benth., is suggested.

* There are two minor references to the genus by Walpers, *Annales* iii, 363 (1852) where he mentions *C. coccinea*; and *Annales* v, 689 (1858) where he gives Schlechtendal's diagnosis of *C. mollis*: this last reference is cited in the *Genera Plantarum* though the original description in *Linnaea* is not.

† *Houllet, Rev. Hortic.* (1873) p. 131. It should, however, be pointed out that Sir Joseph Hooker does not agree with the writer's view in this respect. He refers Houllet's plant to *C. coccinea* (and it may be that form of *C. coccinea* called by Bentham VAR. *major*); Griffith's plant is referred in the *F. B. I.*—as Bentham referred it—to *C. vestita*; *C. mollis* is not quoted in Sir Joseph's article.

‡ *Genera Plantarum*, ii, 1208.

§ *Flor. Brit. Ind.*, iv., 674. This form—apparently more common than true *C. elegans*—extends from Tenasserim to Yunnan. In the Calcutta Herbarium it is in evidence that at one time Kurz thought this distinct from the *C. elegans* of Wallich's description—of which he had no specimen—and proposed naming it *C. martabanica*. Later, he decided that it must be the *C. elegans*, of Wallich's figure, which it resembles, as to tomentum, rather more closely than the true plant does.

‖ *For. Flor. Brit. Burma*, ii, 278.

¶ In Mr. C. B. Clarke's Herbarium this Assam plant is distinguished from the Kumaon *C. vestita* proper, as *C. vestita* VAR. *rugosa* C. B. Clarke MSS.

4. *C. tenuiflora* Hook. f.; the new species referred to above.

Two more recent references to the genus have now to be noticed.

Mr. Hemsley in his *Index Sinensis** mentions one species; this he identifies, though rather doubtfully, with *C. coccinea*. The plant comes from Hupeh, South China, and the same form has more recently been collected in the Kya Valley, Upper Burma, by Genl. Gatacre. It is not *C. coccinea*, but is much more nearly allied to *C. elegans;* though a very distinct form, it is probably quite sufficiently differentiated if treated as a variety of the last named species.

Sir Henry Collett and Mr. Hemsley in a paper *On a Collection of plants from Upper Burma and the Shan States*† mention two species:—

1. *C. elegans* Wall.; the true Wallichian plant, never met with since it was collected by Wallich till it was obtained in 1887 by Genl. Collett, who speaks of it as certainly the most beautiful *Labiate* of the Shan Hills. Like *C. coccinea* VAR. *mollis* (*C. mollis* Schlecht.) this is always an erect shrub;‡ as regards colour of flowers there are two distinct forms, one with pale salmon-coloured, the other with dark red corollas.
2. *C. vestita* Benth., *not of* Wallich; not the true Wallichian plant, but Schlechtendal's *C. mollis*, Mr. Clarke's *C. vestita* VAR. *rugosa*.

The generic descriptions given by Wallich, Bentham, Schlechtendal and Hooker are so accurate and full that nothing can be added to them, and little is necessary beyond providing brief diagnoses of the various forms met with in the genus. Of these last there are altogether seven, and though in this paper they are treated as only of varietal rank, it may well be that other writers will find it necessary to consider them distinct species; indeed, as species at present go in the natural order LABIATÆ, it cannot be denied that forms so very distinct as the real *C. vestita* of Kamaon and as Hooker's *C. tenuiflora* are well entitled to the higher ranks. But what has to be pointed out very distinctly is that on those who may feel compelled to give this higher rank to these species of Wallich and of Hooker, it will be incumbent to recognise also

* *Journ. Linn. Soc.*, xxvi, 299 (1890.)

† *Journ. Linn. Soc.*, xxviii, 1–150 (1890),

‡ Genl. Collett remarks (*Journ. Linn. Soc.* xxviii, 8) on the discrepancy between this fact and the definition by Kurz (*For. Flor. Brit. Burma*, ii, 278) of *C. elegans* as 'a scandent or half-scandent shrub.' Kurz's definition however does not in the least refer to Wallich's original plant but to that other form collected by himself in Pegu, named by Sir Joseph Hooker *C. tenuiflora*, which is always a scandent plant.

Schlechtendal's *C. mollis*, and to give specific rank to that very distinct new form collected in Northern Burma by Gatacre and in South China by Henry.

It is remarkable that the character from tomentum which has been mainly relied upon—and with rather unsatisfactory results—in diagnosing the various species, should still prove the most effective and reliable. It has, however, to be noted that hitherto only the degree of tomentum and not its nature has been referred to, the difference between the simple hairs of the *C. elegans* series and the stellate hairs of the *C. coccinea* series of forms having been overlooked.*

COLQUHOUNIA Wall.

Nat. Ord. *LABIATAE.*

Tribe. *STACHYDEAE.*

Tall, robust, rambling herbs with rounded branches. *Leaves* ovate, margins dentate or crenate, petioled, acute or acuminate, base cuneate, rarely truncate or cordate, tomentose, as are the branches, with stellate or simple hairs. *Whorls* axillary, or in dense or lax-flowered spikes or racemes, of pink, orange, or scarlet, concolorous or spotted flowers. *Calyx* distinctly 10-nerved, equally 5-toothed, throat naked. *Corolla* tube incurved not annulate, throat inflated; galea entire or more rarely notched, shorter than the almost equally 3-lobed lower-lip. *Stamens* 4, ascending under the upper lip, the lower pair longer; anthers conniving in pairs, the cells divaricate, confluent. *Disc* equal; *style* shortly 2-fid with subequal lobes. *Nutlets* oblong, compressed, with the tip produced as a submembranous wing.

1. Colquhounia coccinea Wall., *ampl.*

Tomentum of stellate hairs on stems and leaves; hairs on the corolla many-celled, glandular at the tip; wings of nutlets sub-laciniate, not longer than body of nut; calyx teeth triangular.

Himalaya: Indo-China.

var. *α. typica;* leaves dentate-crenate, tomentum white, usually sparse, ultimately almost disappearing; flowers large, pink or red. *C. coccinea* Wall., Trans. Linn. Soc., xiii, 608 (1822); Tent. Flor. Nap., i., 13, *fig. excl.* (1824); Cat. n. 2085/1 (1829); Benth., Bot. Reg., xv., *sub* 1292 (1829); Lab. Gen. & Sp. 644 (1834): DC. Prodr., xii, 457 (1848); Walp., Ann., iii, 268 (1852): Hook. f., Flor.

* The co-ordinate difference in the nature of the glandular hairs on the corolla, which is as striking, was pointed out to the writer by his friend Mr. Brühl, who kindly went over the forms after they had been sorted out.

Brit. Ind., iv, 674 (1885). *C. coccinea* VAR. *β. major* Benth. *in* Wall. Cat. n. 2085/*β* (1829). *C. vestita* Wall., Tent. Flor. Nap., i, 14, (1829), *and* Pl. As. Rar., iii, 43 (1832), *in part and excluding the Kamaon locality and the figure.*

NEPAL; on Gossain Than, *Wallich! Scully!* and Sheopore, *Wallich!* SIKKIM: Jongri, *King's collector!* and Lachen, *Hooker! G. Gammie!* KHASIA; Mairung, *Hooker and Thomson! Mann!*

A shrub 8–10 feet high, erect when standing alone but of sprawling habit and semi-scandent when growing with other species. In the form originally issued as VAR. *β. major* Benth., the tomentum is white as in *C. vestita*, and unusually dense, while the flowers are generally of a rather paler pink than in the specimens originally intended as typical, where the leaves are often ultimately quite glabrous from an initial rusty pubescence, and the flowers are dark red. Both forms have, however, similarly shaped dentate-crenate leaves, and in both the wings of the nutlets are nearly as long as the body of the nut. These are the forms to which, in spite of his figure, it would be necessary to restrict Wallich's name *C. coccinea*, if *C. vestita* and the others are distinct species.

VAR. *β. vestita* Prain; leaves (sometimes cordate at the base) crenate, crenations large, tomentum dense, floccose, white, separating in patches but not disappearing completely; flowers large pink. *C vestita* Wall., Tent. Flor. Nap., i, 14 (1824) *in part, the Kamaon plant only*; Pl. As. Rar., iii, 43, t. 267 (1832) *as to fig.*; Wall., Cat. n. 2086 (1829): Benth., Bot. Reg., xv, *sub* 1292 (1829); Lab. Gen. & Sp. 644 (1834); DC. Prodr., xii, 457 (1848) *excl. the Assam plant:* Hook. f., Flor., Brit. Ind., iv, 674 (1885) *the Kamaon plant only.*

KAMAON; Srinagar, *Blinkworth!* Naini Tal, *Anderson!* Mussoorie, *King!* Kali valley, *Duthie* n. 3308! CHUMBI; at Tak-Chang, *King's collector!*

Like the preceding this is according to circumstances erect or semi-scandent. The flowers are pale red as in *C. coccinea β. major*, where also the tomentum is white. The leaves, however, (which in *C. vestita* are crenate, none of the crenations being sharp pointed) enable us to distinguish easily the two forms. The gathering from Chumbi has the thinner tomentum of *C. coccinea β. major*, but the leaf-margins are crenate not serrate; it thus serves to connect *C. coccinea* with *C. vestita*.

VAR. *γ. parviflora* Benth.; leaves and flowers smaller than in the type, tomentum rusty, flowers orange or golden yellow, with orange red lobes. *C. coccinea* Wall., Tent. Flor. Nap., i, t. 6 (1824) *the fig. only*; Hook., Bot. Mag. t. 4514 (1850). *C. coccinea* VAR. *parviflora* Benth. *in* Wall., Cat. n. 2085/*γ*

(1829); Lab. Gen. & Sp. 644 (1834); DC. Prodr., xii, 457 (1848).

Nepal; on Sheopore, *Wallich!*

Scandent; this variety is represented only by specimens collected by Wallich; the leaves have larger teeth and somewhat resemble those of *C. elegans*, which is however always a shrub. It is quite as entitled to specific rank as is *C. vestita;* if treated as a species it ought to be known as *C. parviflora.*

var. δ. *mollis* Prain; leaves crenate, crenations very small, tomentum dense, rusty, permanent; flowers large, orange or red. *C. mollis* Schlecht., Linnaea, viii, 681 (1851); Walp., Ann., v, 689 (1858). *C. tomentosa* Houllet, Rev. Hortic., (1873), 131. *C. vestita* Benth., DC. Prodr., xii, 457 (1848) *not of Wall., the Assam plant only*: Hook. f., Flor. Brit. Ind., iv, 674 (1885) *excluding the Kamaon plant; not of* Wall.: Collett & Hemsley, Journ. Linn, Soc. xxviii, 116 (1890); *not of* Wall., *C. vestita* var. *rugosa* C. B. Clarke Mss.

Sikkim; Balasun, *King's collector!* Bootan; *Griffith!* Mishmi; *Griffith* n. 4028 (*Kew Dist.*)! Khasia; Mairung, *Simons! Oldham! Clarke* n. 16138! Shillong, *Mann! Collett!* Dingling, *Clarke* n. 5900! Cherra, *Hooker and Thomson! Clarke* n. 5322! Manipur; Kassome, *Watt* n. 5123! Burma; Shan hills at Pwehla, *Collett!*

An extremely distinct form, always a shrub, and easily recognised by its stout virgate habit and by its nutlets with very short wings. This might be still considered specifically distinct even if C. *vestita* were merged in *C. coccinea*, and if looked upon as a good species it ought to bear the name *C. mollis* Schlecht. The leaves differ from those of *C. coccinea* in being always crenate, and from those of *C. vestita* in the small size of the crenations, and in the rusty, not white, tomentum.

2. Colquhounia elegans Wall., *emend.*

Tomentum of simple hairs on stems and serrate leaves; hairs on the corolla few-celled, glandular at the base; wings of nutlets entire, acute, longer than body of nut; calyx teeth acuminate.

Indo-china; S. China.

var. α. *typica*; whole plant densely, softly tomentose; flowers in very dense many-flowered axillary heads; corolla dark-red or salmon-coloured, with or without crimson spots, tube long, throat wide. *C. elegans* Wall., Cat. n. 2084 (1829); Benth., Bot. Reg., xv, *sub* 1292 (1829); Wall., Pl. As. Rar., iii, 43, t. 268 (1832): Benth., Lab. Gen. & Sp. 645 (1835); DC. Prodr., xii, 457 (1848): Hook. f. Flor. Brit. Ind., iv, 674 (1885); Collett & Hemsley, Journ. Linn. Soc. xxviii, 116 (1890).

Manipur; Sirohifurar, *Watt* n. 7443! Burma; Taong Doung Mts., *Wallich:* Shan Hills at Toungye, *Collett!* at Mone, *Manders! Fulton!* at Lwekaw, *Manders!* Ruby Mines district, frequent, *King's collectors!*.

A shrub, 8 to 10 feet high, and apparently never scandent; the flowers are sometimes red (*Collett*, *King's Collectors*) sometimes salmon-coloured with crimson spots (*Wallich*) sometimes uniformly salmon-coloured (*Collett*, *Fulton*, *Manders*).

var. *β. pauciflora* Prain; almost glabrous throughout, flowers in loose few-flowered axillary heads; corolla red, tube very short, throat wide. *C. coccinea* Hemsl., Journ. Linn. Soc., xxvi, 299 (1890) *not of* Wall.

S. China; Ichang, *A. Henry* n. 3334! Burma; Kya Valley, *Gatacre!*

A very distinct, always scandent form, with a much more slender habit than the preceding; the nutlets are however not distinguishable, and the tomentum is of precisely the same character, though so much slighter in degree. If this is treated as a distinct species, which will be necessary if specific rank continues to be claimed for *C. tenuiflora*, it might be known as *C. pauciflora*.

var. *γ. tenuiflora* Prain; sparsely hairy throughout, flowers in loose many-flowered long axillary racemes; corolla red, tube very long, throat narrowed. *C. tenuiflora* Hook. f., Flor. Brit. Ind., iv, 674 (1885). *C. elegans* Kurz, For. Flor. Brit. Burma, ii, 278 (1877) *not of* Wallich. *C. martabanica* Kurz Mss. in Herb. Calcutta.

S. China; Yunnan, *Anderson!* Burma; Poneshee *Anderson!* Pegu, *Kurz!* Karenni, *Mason!* Tenasserim; Moulmein, *Parish!*

Also a very distinct form; in habit exactly like the last, but with much longer flowers than even in the type, and with an absolutely, as well as relatively, narrower corolla-throat. Distinct, however, though the form is it is not convenient to give it specific rank, as this would necessitate the recognition of *C. parviflora*, *C. mollis*, and *C. pauciflora* as distinct species also.

D. Prain delt. A. C. Mukerjei lith.

PEDICULARIS DIFFUSA Prain.

A. D. Molla delt. A. C. Mukerjei lith.

PEDICULARIS FLACCIDA Prain.

pair are hirsute ; the anthers though muticous as in *P. verticillata* are contiguous and not discrete. The fruit is unknown.

As both these species belong to one natural group it may be useful to provide a key, modified, so as to admit of their reception, from the key already published by the writer (*Ann. Roy. Bot. Garden, Calcutta*, iii, 94), in which the relative position of these and of the previously known species is shown.

VERTICILLATAE.

Galea less than half the length of the lip :—
Bracts flabellate, spike long, dense ; calyx small, subglobose, not cleft, teeth small, entire ; anterior filaments hairy ... *P. svicata.*

Substitute for pages 9, 10, 15 and 16, in No. 1 of Pt. II., Journal for 1893.

the upper ; anterior filaments hairy... *P. diffusa.*
Calyx distinctly cleft, teeth entire :—
Margin of galea even ; anterior filaments hairy ... ... *P. refracta.*
Margin of galea toothed ; filaments not hairy ... ... *P. szetschuanica.*

Explanation of the Plates.

PLATE I. Pedicularis diffusa *Prain.*

1, Flower with bract ; 2, calyx with ovary and style ; 3, half of corolla showing staminal insertion ; 4, stamens ; 5, capsule ; 6 seed : 1, 2, 3 *and* 5 *magnified* $\frac{2}{1}$; 4 *and* 6 *magnified* $\frac{4}{1}$.

PLATE II. Pedicularis flaccida *Prain.*

1, Flower with bract ; 2, calyx with ovary and style ; 3, half of corolla showing staminal insertion : *all magnified* $\frac{2}{1}$.

Some Observations of the Electrical action of Light upon Silver and its Haloid Compounds:—By Colonel J. Waterhouse, I. S. C., *Assistant Surveyor General of India.*

[Received April 20th : Read May 3rd.]

In my paper on "Electro-chemical Reversals with Thio-carbamides," read at the meeting of the Society in April 1891, it was shown that the peculiar reversals of the photographic image produced by the addition of very minute quantities of a thio-carbamide, or sulphourea, to an eikonogen developer appeared to be connected with and accompanied by electro-chemical action, if not actually brought about by it. It was remarked also that the experiments brought forward pointed to the conclusion that, at any rate as regards the haloid salts of silver, the formation and development of the photographic image is to a very great extent influenced by electrical action, more so perhaps, than has generally been recognised, although the fact of photographic action being accompanied by electrical phenomena has been known since the earliest days of photography. It was suggested that a further investigation into the theory of photography based on electrochemical laws, might be of value in throwing light upon much that is now obscure and uncertain as regards the formation and development of the invisible photographic image formed by the exposure to light of silver haloid compounds.

Since that time I have given a good deal of attention to the subject and tried several experiments in various ways with the object of ascertaining the electrical action of light, in connection with photography, on plates of pure silver immersed in various fluids as well as on dry plates and other forms of silver haloid compounds in ordinary photographic use. Also on the action of electrical currents in forming developable compounds of silver haloids similar to those formed by light, and, further, on the electrolysis of ordinary photographic developers and on the currents produced during the development of the photographic image. These observations are not yet sufficiently complete to found any sound deductions upon, but I hope to complete them later. In the meantime, I have thought that a short note on some observations I have lately made on the electrical action of light upon plain silver plates in various solutions, might be of interest and form a suitable introduction to any further notes on this subject I may be able to bring before you. It does not pretend to be complete or exhaustive, and can only be considered as a contribution towards a systematic investigation of the question.

light was admitted. It was also inversely proportional to the square of the distance of the source of light from the apparatus. An oil lamp was used. The instrument appeared to show an exact proportionality between the intensity of the light and that of the current, and its great sensitiveness and precision would enable it to be used as a very delicate photometer. In these experiments he found that the electromotive force exerted by the November sun upon iodised silver plates through an opening 30 mm. wide was $\frac{1}{15}$ of a Daniell cell; with a petroleum lamp, at 8 inches distance, it was only 0·004 Daniell.

Dr. J. Moser afterwards, in 1887, in working on Egoroff's plan found that the photo-electric current might be greatly increased by treating the chlorised, iodised or bromised silver plates with solutions of erythrosin, benzo-purpurin and other dyes, and in sunlight he observed currents of a strength equal to half a volt (Eder's *Jahrbuch der Photographie, &c.*, 1888, p. 297.)

At the meeting of the British Association, in 1880, Professor G. M. Minchin gave an account of his experiments on the generation of electric currents by the action of light on silver plates which were coated with emulsions of bromide, chloride, iodide and other salts of silver in gelatine and collodion, as well as with eosine, fluorescine and various aniline dyes, the object of these experiments being the solution of the problem of producing a photographic image of an object at a distance. A detailed account of these and other interesting experiments on light-cells was read before the Physical Society, and published in the *Philosophical Magazine*, for March 1891.

He found that when two pieces of clean silver foil attached to glass plates were coated with an emulsion of chloride of silver in collodion and immersed in distilled water containing a few grains of common salt, the plates being connected with the terminals of a Thomson's galvanometer and one of them screened from the light, that on exposing the unscreened plate there was an electric current produced, and the exposed plate was *negative* to the unexposed. The same effect was observed with plates coated with emulsions of silver bromide in water containing a little potassium bromide. When the plates were coated with iodide of silver in collodion by the wet silver-bath method, the liquid being water containing a little potassium iodide, there was a reversal of the nature of the exposed plate, it being *positive* to the unexposed. With coloured glasses in front of the exposed plates it was found that the red rays produced comparatively feeble currents, while those produced in the blue and violet rays were very great, but the directions of the current were the same for all rays. This agrees with Becquerel's observations. With plates coated with

an emulsion of silver sulphide in potassic sulphate, the exposed plate was *positive*, the direction of the currents being the same for all rays, the strength of the current being least for the rays passing through the green glass.

With plates coated with an emulsion of silver nitrate in gelatine in a weak solution of barium nitrate, the exposed plate was *positive*. The effect of the red rays was very small, and of the blue rays very great.

One of the most important points in Professor Minchin's observations is his discovery of the formation of an invisible developable deposit on silver plates coated with an emulsion of silver bromide, by the action of the electrical current from a single bichromate cell passing through the plates when immersed in water containing a little potassium bromide. He found (1) that the plate connected with the carbon pole, the cathode, was without the employment of any developer visibly blackened in its immersed part, (2) that no visible change took place on the other plate attached to the zinc, but when the plate was developed with an ordinary pyrogallic acid developer its immersed portion was also blackened. These effects were entirely due to the passage of the current and were strictly confined to those portions of the sensitive plate through which the current passed.

The special bearing of these observations upon the formation and composition of the invisible or visible developable photographic image formed by the action of light, does not appear to have been generally recognised. I began last year a series of observations on this subject which quite confirmed Professor Minchin's : unfortunately they were interrupted before completion, but I hope to resume them in due course, after the completion of the present series, and bring them before the Society on a future occasion.

Professor Minchin also found that by coating silver plates with eosine and gelatine, comparatively strong currents were obtained and the plates were very sensitive to variations in the light. The current generated by daylight in one of these eosine cells was sufficiently strong to produce the photographic action on a silver bromide plate without any preliminary exposure of the bromide plate to gaslight. He also describes a curious case of inversion of the current occurring in the eosine and other cells, which I have also noticed, the initial current being such as to make the exposed plate *positive* to the other. This current, however, was of very short duration and was succeeded by a steady and much stronger normal current in the opposite direction, the exposed plate being *negative* to the unexposed. On suddenly shutting off the light from the plate the instantaneous effect was to

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On the Flora of Narcondam *and* Barren Island.—*By* D. Prain.

Plates III and IV.

[Read May 3rd].

§ Introductory Sketch.

The Indian Ocean is broken on the north by the Indian Peninsula into two roughly triangular seas. The eastern, rather the smaller, forms an area known vaguely as the Bay, Gulf, or Sea of Bengal—the first of these names being that most usually employed—bounded on the west by Ceylon and India, on the east by the Malay Isthmus (Tenasserim) and Indo-China, and on the north by the Gangetic Delta. The ocean-surface thus defined is, however, further differentiated into three distinct hydrographical areas.

These areas are (*a*) the Bay of Bengal, a bight limited to the west by the Kistna Delta, to the east by Cape Negrais and situated to the north of an arbitrary line—the parallel of Lat. 16° N.—beyond which it passes into (*b*) the Sea of Bengal, stretching from Coromandel and Ceylon, on the west, to the Andamans and Nicobars on the east. The Sea of Bengal opens southwards into the Indian Ocean proper, from which it is hydrographically rather definitely limited by the somewhat rapid upward shelving of its floor from the bottom of that ocean to a uniform depth of 2200 fathoms along a line roughly coincident with the parallel of Lat. 6° N. Thereafter its floor is a plain and practically

a level one, for it slopes so gradually northwards that, as it passes into the Bay proper, its depth is still 1400 fathoms. No such clear delimitation exists between Sea and Bay; the plain that forms their common floor still slopes gradually upwards towards the north till, in the neighbourhood of Lat. 20° N., the edge of the shelf of the Gangetic Delta is reached.

The southern edge of the floor of the Sea of Bengal may, in spite of its depth of over 2000 fathoms, be taken as, in a sense, the margin also of the continent of Asia, for there is more than the rapid increase of slope towards the bottom of the Indian Ocean to characterise it. To the west it coincides with that remarkably abrupt terrestrial elevation which results in the island of Ceylon, off the south-west coast of which island, less than 40 miles from the Basses, the ocean depth of 2300 fathoms is reached. To the east a precisely similar terrestrial elevation, though of smaller size and much less height, is met with. Just as Ceylon lies, a pear-shaped eminence, to the east of Lon. 80° E., so to the east of Lon. 90° E. lies the pear-shaped eminence known as Carpenter's Ridge,* a terrestrial mass that rises from a depth of 2300 fathoms in Lat. 5° N., till in Lat. 6° N. and Lon. 90° 30′ E., it reaches a point which carries only 1380 fathoms. The 'thick end' of the pear in both cases faces the south, and just as the 'stalk,' in the case of Ceylon, tails north-westward into the Indian Peninsula, the 'stalk,' in the case of Carpenter's Ridge, tails north-eastward into Middle Andaman. There are these differences between the two; the connecting ridge between Ceylon and India carries nowhere more than 8 fathoms, that between Carpenter's Ridge and the Andamans carries 1600 fathoms, while the highest point of Carpenter's Ridge is as much beneath as the highest point in Ceylon is above sea-level.

The third area (*c*) is the land-locked sea†, bounded on the west by the Andamans and Nicobars, on the north by the Irrawady Delta, on the east by Tenasserim and Kedah, and prolonged south-eastward into the Straits of Malacca, between Sumatra and the Malay Peninsula. This sea is not, as a rule, distinguished by any general name, though

* Alcock: Annals and Magazine of Natural History, ser. vi., iv., 377.

† Carpenter: Records of the Geological Survey of India, xx, 48, had proved, as conclusively as it is possible in the absence of actual soundings to prove, that this body of water must be separated from the Sea of Bengal by a ridge nowhere deeper than 760 fathoms, the shallowest sounding known between Acheen and the Nicobars, since the temperature at 1200 fathoms east of the ridge is that appropriate to 740 fathoms to the west of it. Since then the indication of 736 fathoms as the depth on the line from the Nicobars to the Andamans is a striking confirmation of the justice of Carpenter's reasoning.

that portion of it close to the Irrawaday Delta is spoken of as the Gulf or Bay of Martaban; it has, however, sometimes been spoken of as the Gulf of Pegu, and more recently has received the much more appropriate name of the Andaman Sea.*

* Alcock: Annals and Magazine of Natural History, ser. vi., iv., 378. The degree of confusion in nomenclature that prevails is sufficiently exemplified in the various Atlases of recent date. Keith-Johnstone's "Royal Atlas"—an excellent example of an English Atlas—shows, on the same sheet (India, southern sheet) in the general map, the Bay of Bengal and the Sea of Bengal limited as they are in the text, though the Bay is called the "Gulf" of Bengal: in the small map of the South-Eastern provinces placed on the same sheet this "Gulf" is called, as is more usual, the Bay. No name is given to the Andaman Sea, though the Gulf of Martaban is distinguished. In Stieler's Hand-Atlas—an excellent example of a German Atlas—we find (Sheet 67, by Berghaus) the phrase "Meerbusen von Pegu" used as the precise equivalent of Alcock's later-published but perferable name of "Andaman Sea;" the Gulf of Martaban of the English maps is designated, much more correctly than in English maps, "Bai von Martaban." So much confusion of names and their incidence, renders it necessary to insist on some definite system of nomenclature, with a rigid definition of the areas to which the names apply.

It would seem therefore that German geographers are prepared to admit the distinctness of the Andaman Sea as a geographical area, while to modern English geographers the necessity for considering the question has apparently not occurred. If, however, at present they refuse to recognise this as a truly land-locked area deserving of a specific designation, the following passage from a letter dated Calcutta, the 4th March 1795, from Major A. Kyd to Sir John Shore, then Governor-General, will show that even a hundred years ago those who knew the area best realised its true nature. Kyd says:—The Andaman Islands, "comprehending what "are called the Great and Little Andamans, extending from N. Lat. 18°31′ "southward, and lying nearly in a N. and S. direction between 92° and 93° E. of "Greenwich, are part of a continued range of islands extending from Cape Negrais "to Acheen Head, including the Preparis, Cocos, Car Nicobar, and the Great and "Little Nicobars, the whole being a chain of islands between which there is reason "to believe that there is a continuation of soundings, entirely dividing the eastern "part of the Bay of Bengal." Kyd was Superintendent of the second, or Port Cornwallis settlement in the Andamans, instituted in 1792, when the settlement, under Blair at Old Harbour, now Port Blair, begun in 1789, was abandoned.

As an example of the usage which terms the whole sea-area between India and Indo-China the "Bay of Bengal," may be mentioned a paper by Hume (*Stray Feathers*, vol. ii.) wherein these two islands, along with Preparis, the Cocos, and of course the Andamans and the Nicobars, are termed the Islands in the Bay of Bengal, as opposed to Ceylon, on the one hand, and the Mergui Archipelago, on the other. This is also the usage of the Admiralty Maps of the region, and though it is certainly indefensible on hydrographical grounds, since the area to the east of the Andaman-Nicobar chain fulfils in every particular—far more so than the Sea of Bengal itself—the conditions laid down in the definition of a "Sea," it is preferable to the slip-shod system that distinguishes the Bay of Bengal from the Sea of Bengal, without distinguishing between the Sea of Bengal and the Andaman Sea.

It is in this last-named area that the islands of Narcondam and Barren Island, which form the subject of the present paper, are situated. These islands the writer was, through the kindness of Col. Cadell, v. c., late Chief Commissioner of the Andamans, enabled to visit in March and April 1891, in order to investigate their Flora. Narcondam was examined for ten days in the end of March; after an interval occupied in visiting Little Andaman and the Nicobars,* Barren Island was examined from April 5th to April 8th.

The volcanic island of Narcondam is situated in the Andaman Sea in Lat. 13° 26′ N. and Lon. 95° 15′ E., 80 miles to the east of Port Cornwallis in North Andaman, 74 miles north-north-east of Barren Island, 150 miles to the south of the nearest point on the coast of Pegu, and 250 miles due west of Mergui. The island rises abruptly out of deep water, more especially on its eastern, western and southern sides, to a height of 2330 feet above sea level, and of 8000 feet from the floor of the Andaman sea between it and North Andaman to the west, and between it and Tavoy on the east.†

The soundings on which the conclusion is based are given in the following table:—

TABLE I.‡—*Soundings in the vicinity of* Narcondam.

GENERAL DIRECTION OF LINE OF SOUNDINGS.	DISTANCE IN MILES FROM CENTRAL PEAK.	DEPTH OF SOUNDINGS IN FATHOMS.
E. S. E.	1½	90
E. S. E.	2	75
E. S. E.	2½	138
E. S. E.	3¼	284
E. S. E.	3⅝	333
E. S. E.	4¾	486
E. S. E.	100	1050
S. S. E.	1½	242
S. S. W.	1⅜	182
S. S. W.	2⅜	465
S. S. W.	3½	652
S. S. W.	24½	1010

* Proceedings of the Asiatic Society of Bengal for 1891 (December), p. 156.

† Stieler: Hand Atlas, sheet 67 shows depths, which are quite wrong, of 2097 and 2200 fathoms to the E. and S. E. of Narcondam; how these errors have arisen the writer cannot trace. Sheet 58 of the same Atlas gives the true depth.

‡ This Table, with the corresponding one for Barren Island, is mainly derived from Mallet and Carpenter, Records of the Geological Survey of India, xx, 46, *et seq.*, with additional soundings from a copy of the Sounding-Book of H. M. I. M. Survey Steamer "*Investigator*," kindly lent by Dr. Alcock.

TABLE I.—*Soundings in the vicinity of* Narcondam.—(*Continued.*)

GENERAL DIRECTION OF LINE OF SOUNDINGS.	DISTANCE IN MILES FROM CENTRAL PEAK.	DEPTH OF SOUNDINGS IN FATHOMS.
S. W.	50	1140
W. N. W.	1½	162
W. N. W.	2½	407
W. N. W.	3	509
W. N. W.	3½	585
W. by S.	40	922
N. N. E.	2	74
N. N. E.	2½	104
N. N. E.	3¼	150
N. N. E.	4½	411
N. N. E.	9½	362
N. N. E.	16	290
N. N. E.	52	70
N. N. E.	70	50

The island is a fairly-regular oval with the longer diameter in a line running north-north-east to south-south-west; this diameter is two and a half miles long, the other one and a half. The regularity of outline is somewhat broken at the north-east corner by an oblong peninsula about three furlongs long and half a mile across; this spit, which is occupied by a steep-sided twin-peaked hill, quite dwarfed by the central mass, is in no sense detached from the rest of the island but passes through two or three intervening heights into the main peak. This peak, situated slightly to the south and west of the centre of the island, is crowned by three small points of which the most northern is the highest. The two others, situated a quarter of a mile to the south and to the south-east, respectively, are at the seaward ends of two ridges that diverge from the highest peak, and are separated by the beginning of a deep gorge. The northern point, as already mentioned, reaches 2330 feet; the point to the south is 2150 ft., that to the south-east 2200 feet high. The gorge that separates the two latter, after passing southward between them for about a quarter of a mile, turns south-west round the shoulder of the lower one, and thus partially separates the south end of the island, as a narrow ridge 1200 to 1500 feet high, from the rest of the hill. It is, however, only the western end of this ridge that is free, the eastern end is connected, by means of a narrow but lofty ridge, with the south-eastern part of the central peak. Numerous other gorges, none of them however so striking as that just described, furrow the hill on every side.

The chief interest of this configuration resides in the misapprehensions as to the structure of the island to which it has given rise. McClelland mistook either the ravines or the ridges between them for streams of lava* ; Kurz has described and figured the island as a central volcanic cone, surrounded by an outer ring, not much over half the elevation of the central mass, and very largely broken down.† Seen from Kurz's point of view (N. W., ½ N., at a distance of 20 miles) an oblique view of the mouth of the yawning south-western gorge is obtained, while the main mass hides the connection of its southern wall with the central peak. At the same time the peaks already mentioned as connecting the main hill with the somewhat outlying north-eastern spit, serve to conceal their own connections and complete the illusion. At this distance too the three hummocks at the top of the peak look very much like as many points on the edge of a crater. In a nearer view from the same direction the appearance of a central cone is still well-preserved, though the regularity of what seems at a distance the remains of an outer ring quite disappears.‡ Even close in-shore it is impossible to say whether the three points on the peak are, or are not, indicative of the remains of a crater, the forest that clothes them disguising their true relationship. The appearance from another point of view (W. ½ S., at a distance of 40 miles) agrees well with the description by Horsburgh of "a cone or pyramid with its summit broken off."§

* McClelland : Jour. As. Soc., Beng., vii, 77. It would depend a good deal on the distance from which the island was seen, whether the ravines or the ridges between them be what were taken for 'lava-currents.' Seen from a distance of 6 miles or more, through a glass, the darker shadows caused by the gorges might well enough, as Ball (Records, Geol. Survey of India, vi, 89), and Mallet (Memoirs, Geol. Survey of India, xx, 281) suppose, be what led McClelland astray ; as however the drawing on which McClelland based his opinion was taken from about a mile and a half, or two miles from the eastern shore—the drawing was made by Griffith—there is no doubt that what he took for streams of lava were the ridges between the ravines : on this side of the island these are, towards the top, bare and rugged, and are not unlike streams of lava. After all, however, McClelland had nothing to support his idea that the island was volcanic but its conical shape and its isolation.

† Kurz : Report on the Vegetation of the Andaman Islands, p. 4. Kurz appears to have had nothing more to go upon in supposing the island to be volcanic than had McClelland ; the accident of configuration led him to go further than McClelland, and assume, not only that the island is volcanic, but that it is an island of the same type as Barren Island, in which there is an inner and an outer cone. And with the accounts and the appearance of Barren Island in his recollection—Kurz disposes cursorily of Barren Island in the sentence immediately preceding the one referred to —the idea is by no means unnatural.

‡ Ball : Records of the Geol. Survey of India, vi, 89.

§ Horsburgh : Indian Directory (ed. v), ii, 56.

Throughout the southern half of the island the coast line has been eaten by the sea into bare cliffs that vary in height from 50 to 800 feet. From the appearance these present to any one circumnavigating the island it would seem that these, even at the mouths of the gorges, and even if landing in spite of the heavy swell that usually surges round the island were feasible, must be altogether inaccessible. Much of the northern half of the island is similarly sea-worn, but the northern cliffs are not in many cases very high. The north-west corner of the island is a sharply triangular ness, with a high cliff for its northern, and a sloping hill-side, ending in lower cliffs, for its western seaface. This western slope overlooks a bight half a mile wide, but of only a furlong's recession. This bight, open to the north-west, is divided into two almost equal bays by a small detached islet, between which and the main island stretches a rocky reef. To the south of this islet and reef is a somewhat indifferent anchorage, and landing from a boat is possible on its small shingle beach, behind which a few coco-nut trees grow. This beach is close to the reef and at the mouth of a rather narrow gorge which leads fairly directly to the main peak.

The cliffs that form the east side of this ness overlook a much finer bight bounded on the east by the oblong spit already described, more than half a mile across, and with a recession almost equalling its width. The head of this bight further recedes into a small inviting-looking bay which, however, begins to shoal* about a hundred yards from the shore, and the strong swell that surges round either cape is broken as it crosses the bay into a heavy surf which renders landing neither pleasant nor safe.† This bay, which may be termed Coco Bay, is bounded by a level stretch of turtle-frequented sand, behind which is the only good example of *Pandanus* sea-fence on the island; behind the sea-fence is a fringe of coco-nut trees; beyond the coco-nut zone, and at the mouth of one of the largest gorges in the island, is a small stretch of level land, due, no doubt, like the shallowness of the bay, to the deposition of detritus from the main hill. In this flat patch, immediately behind the coco-nuts and to the west side of the stream-bed, is a grove of plantains.

* Ball: Records of the Geol. Survey of India, vi, 89.

† Hume: Stray Feathers, ii, 109. The landing mentioned by Ball and described by Hume is the only one on record at this bay. Probably, however, it is not the only one that has been effected. Though the *Coco-nuts* that line its margin may have been introduced by the sea, this cannot be said of a grove of *Plantains* that occurs. Landing did not seem possible at the time of the writer's visit, nor was it necessary; the bay, which was visited several times, was reached by cutting a path through the jungle from Anchorage Bay. It is of course possible, though hardly likely, that the individuals who introduced the *Plantains* also cut such a path.

To the south-east of the oblong spit, and therefore on the east side of the island, is a third, much wider bight, three-quarters of a mile from cape to cape, but only receding a furlong and a half. The northern half of this bay, bounded by the hilly spit, is overlooked by steep hill-sides ending in cliffs that, though not lofty, are particularly abrupt. The southern half, limited by the main island-mass, has a beach of rounded boulders; behind this is a straggling sea-fence in which stands a solitary coco-nut tree; a narrow belt of true beach-forest lies beyond. It was with little expectation of being able to land that we put into this bay; we were therefore agreeably surprised to find that—at least at the time of our visit, the end of March—not only could a landing be made without difficulty, but that the bay afforded a more comfortable anchorage than Anchorage Bay itself. The boulder beach slopes rather gradually outwards, and is of a considerable width; probably therefore the surf here is very strong during the north-east monsoon. That the sea-fence is here irregular and thin is no doubt due partly to the surf, and partly to the fact that it has an insecure root-hold among the rounded stones that are piled behind the beach into an embankment which protects the forest beyond. This beach-forest occupies a strip of level land that stretches backwards from 50 to 100 yards to the base of the main hill. Three gorges debouch on this level area and have filled up the interstices of the old beach with the soil on which the trees grow. At the mouth of one of these ravines there is a gap in the beach-forest occupied by a small depression that in March is covered with only a coating of fine sun-cracked mud, but in the rains evidently forms a small lagoon; this appears to be the only spot in the island where water ever lodges.

Though entirely volcanic in structure there is no indication at the summit or elsewhere that the island has recently been active. There is no crater at the top*, and his examination led the writer to think, not that all traces of craterine shape have been obliterated by long erosion, but that there never has been any crater on the peak. The local features, coupled with the nature of the rocks that constitute the island,†

* Mallet: Memoirs of the Geol. Survey of India, xxi, 281.

† Ball: Records of the Geol. Survey of India, vi, 90, only mentions a bed of volcanic agglomerate, (of which several crop out round the coast), at Coco Bay, wherein are embedded trachytic boulders. Mallet—Memoirs of the Geol. Survey of India xxi, 281–283—describes the Narcondam lavas as "compact, or very slightly vesicular "lavas in which crystals of white translucent felspar, and black or dark-brown "hornblende, are disseminated through a ground-mass which is (generally light) "grey in unaltered specimens, but pale red in those that have undergone weathering "and in which the iron has been peroxidised." Farther on, Mallet remarks:—"The "lavas of Narcondam are essentially hornblende andesites, and are of a decidedly "more acid character than those of Barren Island." This character of acidity

appear to indicate that originally Narcondam may have been a volcano, produced, like the volcano that appeared on the Island of Camiguin in July 1871,* by the extrusion of viscid lava without the accompaniment of crater-forming materials. In any case, the depth of the ravines that plough the flanks of the hill on every side indicates very clearly how remote has been the period of the island's activity.†

The top of the island is frequently bathed in cloud;‡ during the ten days spent in the island in 1891, this cloud-cap seemed to envelope, for the greater part of the day, the last 400 feet of the peak. The appearance, however, was slightly deceptive; for it was noticed that the cloud was only condensed on the western aspect of the hill, and that towards evening the peak always became clear. The nature of the vegetation on the peak,—the trees bearded with moss, and their bark covered with *Trichomanes*—indicates clearly that this is a usual state of affairs.

Save on the sea-cliffs, which are bare, and on the eastern side of the peak near the top, where the jungle is thin and scrubby, the whole island is clothed with dense forest: this consists mainly of lofty trees, with but few climbers, in the beds of the various watercourses. On the intervening ridges the vegetation consists of a tangled mass of shrubby growth overloaded with creepers. Landing at Anchorage Bay one finds on the shingle some plants of *Ipomœa biloba;* immediately behind the shingle, and under the shade of about a dozen coco-nut trees, is an attempt at a sea-fence, composed of *Scævola Koenigii*, *Hibiscus tiliaceus*, *Morinda bracteata*, *Guettarda speciosa*, *Pandanus odoratissimus;* some *Ipomœa grandiflora*, *Convolvulus parviflorus*, and *Wedelia scandens* climb over these. Behind these bushes some trees of *Barringtonia speciosa*, *Terminalia Catappa*, *Erythrina indica*, *Sterculia rubiginosa*, *Thespesia populnea*, *Dracœna angustifolia*, *Ardisia humilis*, and *Ixora brunnescens* represent the beach-forest. There is, however, but scanty room for species of either class, and a few plants of *Eranthemum succifolium* underneath the trees complete the representation of this sort of vegetation in this situation. To the south of this point are some low cliffs, covered at the top with a tangled mass of *Hoya orbiculata*, while at their base plants of *Pluchea indica*, *Blumea glomerata*, *Vernonia divergens*, *Desmodium polycarpon*, *Cyperus pennatus*, and *Thysanolœna acarifera* occur; the last-named,—it is, by the way, the only grass that is found on the island—is the most plentiful and seems to be, besides *Fimbristylis ferruginea* and *Boerhaavia*

strongly supports the conclusion (to which Mallet also inclines) that there never was a crater in Narcondam, and that the island is of the endogenous volcanic type.

* Moseley: "Notes by a Naturalist on the 'Challenger,'" p. 409.

† Mallet: Memoirs of the Geol. Survey of India, xxi, 284.

‡ Ball: Records of the Geol. Survey of India, vi 89.

repens, about the only species that occurs on the rocky sea-cliffs. On the small islet in Anchorage Bay and on the rocks to the north of the reef that connects it with the main island, is a scrubby jungle of *Hibiscus tiliaceus*, *Acacia concinna*, *Dalbergia monosperma*, *Premna integrifolia*, *Glochidion calocarpum*, *Breynia rhamnoides*, *Blachia andamanica*, and *Gelonium bifarium*,—the last-named especially plentiful.

In the denser interior jungle on the hill between Anchorage Bay and the gorge that debouches at Coco Bay, one is struck by the familiar Andaman feature of groves of gregarious Euphorbiaceous treelets forming an under-growth in a forest of lofty trees. Of this forest, *Ficus nitida* and *Ficus Rumphii* are perhaps the chief constituents; the two commonest gregarious species are *Actephila excelsa*—undoubtedly the species on the island represented by the greatest number of individuals, and *Mallotus andamanicus*—also, in many places, very plentiful. The herbaceous species found underneath these treelets are mainly two ferns: *Acrostichum appendiculatum*, which is not very plentiful, and *Asplenium urophyllum*, which is. Among other species, found chiefly on a comparatively level tract on the top of the ridge, where the gregarious feature noted during the ascent from the east coast gives place to a mixed forest, the undergrowth includes *Alsodeia bengalensis*, *Canssjera Rheedei*, *Glycosmis pentaphylla*, *Capparis sepiaria*, *Pisonia aculleata*, *Vitis lanceolaria*, *Leea sambucina*, *Memecylon edule*, *Abrus precatorius*, *Mucuna gigantea*, *Bridelia tomentosa*, *Ficus hispida*; *Acrostichum appendiculatum* is here common, while *Asplenium urophyllum* is rare. The trees are also more mixed, and include, besides the two species of *Ficus* already mentioned, a *Bombax*, *Erioglossum edule*, *Diospyros Kurzii*, *Oroxylum indicum*, *Artocarpus Lacoocha*, *Antiaris toxicaria*, *Ficus comosa*, and *Amoora decandra*. Besides the two ferns mentioned, a not infrequent herbaceous species is a fine *Amorphophallus*. Along the ravine that passes northward to debouch at Coco Bay occur the same species; near its mouth, where the ground is flat, the jungle becomes 'scrub'—*Morinda*, *Premna*, and such like shrubs, loaded with tangled masses of *Ipomœa vitifolia*. This type of jungle takes the place of the absent beach-forest; the sea-fence is however well-developed, and is of the usual Malayan type,—*Pandanus*, *Guettarda*, *Morinda*, *Hibiscus tiliaceus*, *Cæsalpinia Bonducella*, *Colubrina asiatica*, *Allophylus Cobbe*, *Vigna lutea*, *Canavalia turgida*, and such like plants. Round this bay the coco-nut zone is well developed; behind it is the plantain grove already referred to.

East Bay, visited subsequently, may be here most conveniently described. On the beach occur both *Ipomœa denticulata* and *Ipomœa biloba*; along with these occur *Vigna lutea* and *Phaseolus adenanthus*; the sea-fence is represented by a few examples of *Pandanus odoratissimus*,

Hibiscus tiliaceus, *Capparis tenera*, *Colubrina asiatica* and *Clerodendron inerme*. The true beach-forest, here well developed, contains much *Pisonia excelsa*, with a number of trees of the far less common *Pisonia alba;* the other trees of the zone are *Terminalia Catappa*, *Calophyllum inophyllum*, *Thespesia populnea*, *Gyrocarpus Jacquinii*, *Ixora brunnescens*, *Ficus brevicuspis*, *Ficus callosa*, *Odina Wodier*, and *Garuga pinnata* ; the two last-named, though commonest in, are not confined to this zone. The single coco-nut tree mentioned as occurring here has probably grown from a nut drifted round from the other bay ; at Coco Bay, however, it is more probable, considering their association with plantains that the trees have been introduced intentionally.* The edges and bed of the dry lagoon already described were covered with *Ipomœa Turpethum*.

Along the edge of the cliff overlooking the west side of Coco Bay some species, not seen elsewhere, were met with : *Entada scandens*, *Acacia concinna*, a *Grewia* (in leaf only, perhaps *G lævigata*), a *Tylophora* (in fruit only, perhaps *T. globifera*), *Pœderia fœtida*, and *Dioscorea sativa*. The steep hill-side overlooking the northern part of Anchorage Bay is covered with a scrub-jungle of *Premna*, *Breynia*, and such like shrubs, with a good deal of *Capparis sepiaria*. All over this hill were seen withered leaves of the *Amorphophallus*.† The hill-side overlooking the southern portion of Anchorage Bay is covered with the same dense

* These coco-nuts are too old and too numerous to have been introduced of recent years ; it seems strange, therefore, that they have never before been mentioned. The recorded visits to Narcondam are :—(1). That of Messrs. Hume and Ball in 1873, when a landing was effected, and no more ; (2). that of Messrs. Mallet and Hobday in 1884, when four days were spent in investigating its geology and topography, and an ascent, probably the first, was made of the peak ; (3). the present visit, when the peak was again ascended. The account of their landing-place shows that it was at Coco Bay that Ball and Hume landed ; at no other bay is there shoal water. Ball mentions some of the plants noticed by him at this place, but neither he nor Hume have recorded the existence of coco-nuts and plantains. Mallet is equally silent, his paper being rigidly confined to the topography and geology of the island. Though these are the only recorded visits, there have been others paid to the island. Hume (*Stray Feathers* ii, 110) mentions a visit by Col. Tytler. Again, Kurz (*Report on the Vegetation of the Andamans*, p. 13.) mentions a deputation that visited Barren Island in 1866, in search of pasture-grasses ; from specimens in the Calcutta Herbarium, however, we learn that this deputation a few days later visited Narcondam and the Coco Group. In connection with the systematic list, occasion will be taken to refer to the acts of the deputation in question : it is sufficient to say here that to its members is probably due the merit of having introduced, *at least* the plantains, and perhaps also the coco-nuts. This would make it certain that both species were present at the time of Hume's visit.

† Corms and seeds of this plant were brought to the Royal Botanic Gardens, Calcutta, where it has sent up leaves and has flowered.

forest, mainly *Ficus*, but has for its undergrowth quantities of *Caryota mitis*, with dense patches of *Pollia Aclisia* underneath.

The ridges between the gorges are tolerably uniform in the nature of their vegetation; *Premna integrifolia* extends a good way up, *Morinda bracteata* is found throughout the island and is as common at the top as it is on the coast; *Trema amboinensis*, *Capparis sepiaria*, and *Acacia concinna*, are common species; not infrequent is *Callicarpa arborea*, though far less common here than on Barren Island. In the gorges patches of *Macaranga Tanarius*, *Trema amboinensis*, *Pipturus velutinus*, *Bœhmeria malabarica*, as gregarious species, are common, and form, especially in the lower part of the hill, the prevalent undergrowth. The trees are those already enumerated, but as additional species, may be mentioned the following, all obtained in the gorge leading from Anchorage Bay to the summit of the peak:—*Amoora Rohituka*, *Apodytes andamanica*, *Semecarpus heterophylla*, *Myristica glauca*, *Ficus glaberrima*—the last mentioned a small tree, at about 2000 feet elevation. The climbers not previously noted were *Anamirta Cocculus*, frequent; *Antitaxis calocarpa*, very common; *Aristolochia Tagala*; *Gouania leptostachya*; *Trichosanthes palmata*; *Anodendron paniculatum*; *Dischidia nummularia*; *Pothos scandens*, and *Strychnos acuminata*, at about 1200 feet elevation. The herbaceous species not before observed were *Blumea myriocephala*, only once at about 1600 feet elevation; *Asplenium nidus*, seen on trees throughout the ascent; *Nephrodium terminans*, not common below 1000 feet, very frequent above that height; *Davallia speluncæ*, here and there throughout the ascent, *Polypodium irioides*, at about 1800 feet elevation; *Polypodium adnascens*, on trees throughout the island, not common; *Bryum coronatum*.

As the summit is neared, and one passes within the area usually moistened by the cloud-cap, the trees are covered with moss (*Neckera rugulosa*), and bear on their bark quantities of *Trichomanes pyxidiferum*. In other respects the jungle on the top does not differ from that lower down, except that, owing to the ridges being of necessity greater in proportion to the gorges than lower down the hill, there is relatively more of scrub jungle than one finds below.

Few *Fungi* were obtained during the visit: doubtless the season of the year was unfavourable. No *Algæ* were found either on the rocks or washed up on the beaches. The ocean-drifts consisted almost entirely of fruits or seeds of species that occur on the island; the only exception noted was a fruit of *Heritiera littoralis* found at East Bay.

Barren Island is situated in the Andaman Sea, in Lat. 12° 15′ N. and Lon. 93° 50′ E., 60 miles to the east of Middle Andaman, 74 miles south-south-west of Narcondam, 80 miles north-north-east of Flat Rock

(a submarine peak that reaches the surface, but no more, in Lat. 11° 12′ N. and Lon. 93° 36′ E.), and 320 miles due west of Mergui. As shown in the subjoined table, the island, like Narcondam, rises abruptly out of deep water, especially on its eastern, western and northern sides, to a height of 8000 feet or more* above the floor of the Andaman Sea.

TABLE II.—*Soundings in the vicinity of* Barren Island.

General direction of line of soundings.	Distance in miles from central cone.	Depth of sounding in fathoms.
E. S. E.	1¼ (¼ mile from shore).	118
E. S. E.	2¼	433
E. S. E.	3¼	641
E. S. E.	100	1260
N. N. E.	1¼ (½ mile from shore).	217
N. N. E.	2¼	545
N. N. E.	3¾	782
N.	1½	325
N.	25½	1,140
W. N. W.	1¼ (½ mile from shore).	180
W. N. W.	2¼	456
W. N. W.	4½	655
W. N. W.	45	1159
W.	1⅜	169
W.	30	1130
S. S. W.	1⅜ (⅜ mile from shore).	47
S. S. W.	3¼	238
S. S. W.	4½	413

Physiographical accounts of this island have been given by Ball† and Mallet‡ in whose papers a précis of previous information is also contained; a brief description is therefore all that is here necessary.

Nearly circular in outline and about two miles in diameter, the island consists of a huge crater, of which the mouth is a mile wide and the rim is from three-quarters of a mile thick at the base—throughout its southern half, where it is from 920 to 1160 feet high—to barely half-a-mile thick—along the north where its height is from 630 to 790 feet. The rim is further breached to below sea-level on the west side by a part of the original hill having been at one time blown away, the resulting gap being about a-quarter of a mile wide. In the middle of

* Mallet and Carpenter: Records of the Geol. Survey of India, xx, 46, (*footnote*).

† Ball: Records of the Geol. Survey of India, vi, 81.

‡ Mallet: Memoirs of the Geol. Survey of India, 251, *et. seq.*

the amphitheatre that results, and therefore about a-quarter of a mile to the north of the centre of the island, a newer perfect volcanic cone rises to a height of 1015 feet. At the top there is an ovoid crater, somewhat straighter along its northern than its southern edge, and somewhat higher on these edges than at either extremity. The edges mentioned are nearly 80 feet above the bottom of the cup which is itself sub-divided into two parts. The western, somewhat irregular, is full of loose lava fragments, and has its floor nearly 40 feet higher than the other, which is an almost perfect circle, about 20 yards wide, with a floor of smooth soft sand. At the west end the rim of the crater is about 40 feet lower than along the north and south edges, and is thus very little above the floor of the minor western depression. In the middle of this dip the rim carries a huge lava block, about 20 feet long, 10 ft. wide, and nearly 20 feet high.* This block forms a striking object on the cone as seen from the landing-place. At the eastern end of the crater the rim dips even more, and is about 60 feet below the level of the northern and southern edges, or just over 20 feet above the floor; the edge is here narrower than elsewhere. In and about the crater are several solfataras with crevices whence steam escapes.

The cone itself consists of volcanic ashes, fairly firm on the south, east and north sides, but loose and friable on the western face. The slope is very uniform, being about 30° on every side. The valley between the cones contains, at the base of the inner, two lava streams that have flowed to the sea through the breach in the outer; of these streams the northern overlies the southern. There has also been a third flow to the east, this does not, however, come in contact with either of the others. The sea, it may be remarked, does not enter the breach in the outer cone, the breach, as well as the valley between the cones, being filled to above sea-level by the products of the newer volcano.

The seaward slope of the outer cone is much steeper in the northern than in the southern part of the island, and is furrowed by many nearly meridional ravines, difficult of access where they enter the sea, but more easily traversed further up. The slope of this half of the ancient crater towards the newer volcano is, on the other hand, even and rounded, consisting for the main part of bare, loose black ash, derived from the inner cone. The inner slope of the southern half of the original volcano is, on the other hand, except at its base, steeply precipitous; the seaward slope of this half, besides being much more gradual than that

* The measurements (Mallet: Memoirs of the Geol. Survey of India, xxi, 267) are:—Length, 22 feet; breadth, 11 feet, height, 13 to 19 feet. The greatest height is at the west end, where it is also narrowest; its most striking aspect is to the spectator on the beach at the landing-place, to whom it looks like a huge tooth.

of the northern half, shows a second subconcentric ridge separated from the true rim by a gorge that debouches on the east side of the island. Gorge and ridge owe their origin, however,—like the ridge and ravine of the same nature, but of more imposing proportions, that occur at the south end of Narcondam—to subaërial denudation, not to volcanic action.

The excentric position of the newer cone, with the lesser relative height, and the steeper seaward slope of the northern half of the original crater, seems to point to subsidence of that half. Perhaps the explosive eruption which effected the breach to the west may have had some connection, direct or indirect, with this subsidence. The volcano represented by the outer cone was doubtless at one time much higher than it is now.

At the landing-place in the breach there is a hot spring on the beach; the temperature of this spring is steadily falling, and at the time of the writer's visit was 106° F.* The spring doubtless only represents percolation of rain water through the heated newer materials—the inner cone and lava streams—contained within the circuit of the ancient crater.†

The anchorage in the bay at the breach is of the most uncomfortable description; the safest anchorage is opposite a small bay with a sandy beach, a *Pandanus* sea-fence and a line of Coco-nut trees, on the south-west side of the island. Landing by boat is, however, usually quite easy on the beach at the hot spring to the north of the point where the lava stream falls into the sea; the surf that rolls into Anchorage Bay must make it impossible, as a rule, to land there.

At Landing Bay the boulders and stones on the beach, bathed by the water of the hot-spring, are covered by a species of *Calothrix* which occurs in considerable quantities. Another, *Alga*, also a *Calothrix*, was obtained from bare rocks in one of the gorges; no marine *Algæ* were seen. On the beach itself, behind a small bed of drift, are some examples of *Ipomœa biloba*; the drift contained, in addition to fruits and seeds of species noticed in the island, fruits of *Barringtonia speciosa* and of *Heritiera littoralis*.‡ Close to the beach and to the lava flow is an example of *Pongamia glabra*; a little further inland to the north of the lava is a considerable grove of *Flueggia microcarpa*, with quantities of *Mitreola oldenlandioides*, in the sandy soil beneath. Beyond this grove is

* Prain: Proceedings As. Soc., Bengal, 1891, p. 84.

† Mallet: Memoirs of the Geol. Survey of India, xxi, 274.

‡ *Barringtonia speciosa* occurs in Narcondam, and it may possibly also occur at some of the bays on the south-west and south of Barren Island, where the surf made landing impracticable. But *Heritiera littoralis*, the fruits of which were collected in Narcondam also, does not seem to occur in either island.

a thicket of *Mussuenda macrophylla*—the accident of its situation has converted the species into a straggling shrub and imparted to it a very distinct facies. On the lava itself nothing grows, though further inland and to the south of the stream it is in several places partially covered by beds of *Aganosma marginata*, which, rooted in the adjacent soil, and having no trees on which to climb, prefers sprawling over the bare black lava to spreading along the ground among the grass. This grass, *Ischæmum muticum*, almost completely occupies the plain between the lava flow and the inner wall of the outer cone, which is thus a great meadow in which, however, there are some patches of scrub jungle, the chief constituents being *Dodonæa viscosa*, *Flueggia microcarpa*, *Gelonium bifarium*, *Phyllanthus reticulatus*, *Trema amboinensis*, *Dalbergia tamarindifolia*, and stunted examples of *Callicarpa arborea*.

The inner cone is merely a "cinder-heap," with hardly any vegetation; a few very stunted examples of *Trema amboinensis* on its southern face, about 650 feet up, and small shrivelled tussocks of *Fimbristylis ferruginea* scattered unevenly over all the sides except the western, being the only plants present. The interior of the crater has more vegetation than the whole outside of the cone; near the crevices in the inner wall, and especially on the south side where the soil is moistened by the condensation of escaping steam, occur *Nephrolepis tuberosa* (also obtained elsewhere in the island), *Cheilanthes tenuifolia* (very small and stunted specimens), *Lycopodium cernuum* (all over the stones in the western, more shallow depression of the crater), *Psilotum triquetrum* (also found in Java, on the crater of Gunong Boddas Preanger, by H. O. Forbes), *Pholidota imbricata*, *Vandellia crustacea* and *Oldenlandia corymbosa*; in the sand at the bottom of the deeper eastern craterine depression occur luxuriant patches of *Fimbristylis ferruginea*.

An attempt was made to land at Anchorage Bay; owing, however, to the heavy surf that rolls in this was found to be impossible. The beach in this bay is sandy; behind it could be seen the usual sea-fence of *Pandanus*, a species seen nowhere else on the island. Just within the *Pandanus* fence rise 13 coco-nut trees tall enough to be seen and counted. Judging from the analagous beaches in the Coco Group and Narcondam it may be anticipated that there are many seedlings besides. To verify this surmise an attempt was made later on to cross the outer cone from the amphitheatre and work down to this beach. The attempt did not succeed; the sea was reached at a point too far to the east and the attempt was not considered worth repeating.* Rowing round the island

* Those who have been engaged in similar work will understand how difficult it is under such circumstances to strike the proper ridge or ravine. The results of the journey, which it took a day to accomplish, were not sufficiently remunerative

a landing-place was looked for in bay after bay; to no purpose, however, the heavy south-western swell surged on their beaches in breakers so huge that any attempt to land was precluded. On the east, north, and north-west sides however, landings were effected; in the first case the crest of the outer rim was attained at a point where further progress was barred by its precipitous nature. By the gorge entered from the north it was found impossible even to reach the crest; the north-west landing, after some difficult climbing, led to the edge of the outer cone and permitted an easy descent into the amphitheatre.

The inner walls of the outer cone, where too steep for trees and shrubs, are densely and evenly clothed with *Pogonatherum saccharoideum*, along with which are associated patches of *Desmodium polycarpon*, *Onychium auratum*, *Pteris biaurita*, *Nephrolepis tuberosa* (found also within the crater), and *Fimbristylis diphylla*. On one somewhat damp spot, where there had been recently a small landslip, were found, on the otherwise bare soil, some plants of *Pteris longifolia*, *Oplismenus Burmanni*, *Physalis minima* and *Vandellia crustacea* (this last was also obtained inside the crater). On the inner northern wall of the outer cone, which is heaped with ashes, there is hardly more vegetation than on the inner cone itself, the only species that grows being the *Fimbristylis* found on the cone. At the base of the cliff which forms the inner southern wall there is a uniform but not very dense forest the commonest species in which are *Terminalia Catappa* (certainly the most abundant tree on the island), *Eugenia Jambolana* and *Callicarpa arborea* (both very common), *Semecarpus heterophylla*, *Garuga pinnata*, *Ixora cuneifolia*, *Ardisia humilis*, *Oroxylum indicum*, *Macaranga Tanarius*, *Trema amboinensis*. Quite a feature is the extent to which a wild vine, *Vitis repens*, prevails in this area; among other creepers noted were *Cyclea peltata* (not seen in Narcondam), *Abrus precatorius*, and two *Dioscoreas* (only one apparently occurring in Narcondam). Another noteworthy feature of this forest is the presence, though not in great quantity, of a species of *Dendrobrium*. The bare rocks in the gorges over which water in the rains must pour in cascades are here and there covered with dried-up masses of fresh-water *Alga*, *Calothrix tasmanica*.

The forest on the outside of the outer cone is much like that just described though the trees are more weather-beaten. The species present inside are all met with outside also, but though *Terminalia Catappa* is still undoubtedly the most plentiful tree, and there are many

considering the limited time at the writer's disposal, to justify another attempt. The majority of the gorges on the south side of the Island have an eastward tendency, and are thus unlike those in the north side which are more truly radial; this circumstance led to the selection of a point for descent too far along the rim.

examples of *Ficus Rumphii* and *Ficus nitida*, with a considerable number of *Ficus cuspidifera*. The two *Dioscoreas* are very common climbers; *Capparis sepiaria* is exceedingly common as a climber, or rather as an undershrub, in the forest; *Gloriosa superba* was seen in the seaface jungle on the east side of the island; *Adiantum lunulatum*, another species not seen in Narcondam, is very common on the outside of the outer cone. On bare rocks near the sea *Boerhaavia repens* is plentiful, and species of the littoral class noted at the points where landings were effected include *Hibiscus tiliaceus*, *Sterculia rubiginosa*, *Colubrina asiatica*, *Ixora brunnescens*, *Pluchea indica*, *Wedelia scandens*, *Scævola Koenigii*, *Premna integrifolia*, *Glochidion calocarpum*, *Gelonium bifarium*. *Terminalia Catappa*, a truly littoral species, spreads here from base to top of the outer cone; the same is true of *Morinda bracteata*, another plentiful sea-coast species. *Cocos* and *Pandanus* have been already mentioned as occurring only at Anchorage Bay.

The question regarding the Coco-nut trees on Barren Island is somewhat simpler than in the case of Narcondam, for they have not been deliberately planted: at the same time it cannot be contended that they afford an unequivocal instance of introduction by the sea. It is not clear that any one has ever landed at Anchorage Bay;* it is certain that for the greater part of the year, to attempt to do so would be very dangerous. At the same time when ships call they usually anchor at this place, and it is not improbable that during some such visit a coco-nut dropping overboard has been washed ashore and germinated in the drift collected by the roots of the sea-fence. Man indirectly, rather than the sea, may therefore be supposed to have been the introducing agent.

Fungi were as scarce on Barren Island as in Narcondam, and the only moss met with was *Bryum coronatum*.

To complete the account of these islands mention must be made of Flat Rock, situated, as has been already mentioned, in Lat. 11° 12′ N., and Lon. 93° 86′ E., 80 miles south-south-west of Barren Island, 50

* From the *Report* of the Andamans' Committee already referred to (*Proceedings, As. Soc. Bengal*, 1866, p. 215) it would appear that their experience was quite that of the writer. The passage is interesting and is worth quoting *verbatim*:—"The only "place where there seemed any chance, was on the south-west, where a small "sandy-beach, with a heavy surf running, was discovered, *above which four old* "*cocoanut trees were seen*. A boat was sent towards the shore and got bottom at 35 "fathoms, but as we had not much time to spare, the whole of the ground could "not be gone over, * * *." The italics are the writer's; the passage will be referred to again in the systematic list of the plants collected. It is strange that though from the year 1866 onwards these coco-nut trees have been used as the guide-mark to the safest anchorage on the coast of this island, neither Hume, Ball nor Mallet, in their accounts of the island, have noted their presence.

miles east-south-east of Rutland Island, and the same distance due east of the opening, Duncan Passage, between Rutland Island and Little Andaman. The rock appears above the surface, and no more; but though so much smaller as a subaërial peak than Barren Island or Narcondam, as a submarine peak it is evidently larger than either, since its summit appears as a long narrow bank that carries from 15 to 80 fathoms of water; this bank does not extend to the east or the west for more than two miles from the Rock, but towards the south extends at least 10 miles, to the north more than 20 miles. Beyond the edge of this bank—the Invisible Bank of the Admiralty maps—the lead sinks at once into deeper water. The Bank itself has been carefully surveyed but of the absolute depths of the soundings just beyond we know little or nothing, so that though this survey is invaluable to navigators, from a hydrographical point of view it leaves much to be desired. Meagre however as its details are it shows that the soundings are deeper towards the east, south, and west than they are towards the north. The following Table indicates the soundings shown in the Admiralty maps:—

Table III.—*Soundings in the vicinity of* Flat Rock.

General direction of line of soundings.	Distance in miles from rock.	Depth in fathoms.
N. N. E.	1	14
N. N. E.	10	25
N. N. E.	13	27
.....	.....	.....
N.	5	38
N.	15	80
.....	.....	.....
N. W.	5	16
N. W.	10	59
N. W.	15	168
.....	.....	.....
W	10	90 (no bottom.)
W.	35	500
.....	.....	.....
S. W.	$3\frac{1}{2}$	78
.....	.....	.....
S. S. W.	8	35
S. S. W.	16	200 (no bottom.)
.....	.....	.....
S. E.	2	16
S. E.	7	48
S. E.	12	200 (no bottom.)

Along the east side of the bank none of the soundings made have touched bottom, but they show that the edge drops into deep water within 5 miles of a line running from south-south-west to north-north-east

through the rock; along this line the soundings show a rather sharp ridge with relatively shallower soundings for the whole length of the bank; this line, it is hardly necessary to repeat, is that on which both Narcondam and Barren Island also show their shallowest soundings, while the axes of all three islands indicated by this direction form very nearly a continuous straight line.

The nature of the bottom on this bank is only mentioned in the case of one sounding; this depth, 25 fathoms, gives, as might be expected, coral: it would be interesting to ascertain whether the subaerial portion, Flat Rock itself, is part of a raised coral reef, or a remnant of an originally larger island of volcanic structure. Raised coral reefs occur in the Andamans to the west, and in the Nicobars to the south; it may therefore be anticipated that here it will be found that the subaerial portion of the bank is weathered coral; at the same time it would be more satisfactory to have the question settled by a visit to the rock. Reasoning from analogy, however, there is little doubt that the basis of this coral bank is a submarine volcanic peak, and that it forms but one of a series to which the others also belong.

Our knowledge of the bottom-contour of the Andaman Sea is not so satisfactory as is that of the Sea of Bengal. English geographers give no attention to the point; German geographers have mapped the sea somewhat hastily and from rather meagre data. Thus Berghaus indicates by the contour lines in a map of "Heights and Depths"* that a deep gap, connecting the Sea of Bengal and the Andaman Sea, exists between Achin Head in Sumatra and the Nicobars. It has however long been known that the ridge in this channel carries only 760 fathoms of water. In a larger map† Berghaus shows deep water as overlying not only the ridge between the Nicobars and Sumatra, but also over that between the Andamans and Nicobars and, what is quite unaccountable, between Preparis and the Coco Group; this last channel has long been known to carry no more than 150 fathoms. As regards that between Little Andaman and the Nicobars, Carpenter had, on grounds of temperature, predicted what Hoskyn has since shown to be true, that the ridge under it could carry at the utmost 740 fathoms; its actual depth is 736 fathoms. In this map also two soundings are shown in the meridian of Lon. 96° 10′ E., one of them in Lat. 11° 35′ N., for

* Stieler's Hand Atlas, Sheet 8, dated 1878.

† Stieler's Hand Atlas, Sheet 67, dated 1881 and revised to 1884; scale 1: 12,500,000. Perhaps the contour line in this map means the 100 fathom line; this would explain the shading in the straits mentioned. If so, it is too far from land, and coincides with the 1000 fathom line rather than the 100 fathom one.

which 2300 fathoms are indicated; the other in Lat. 12° 30′ N. gives 2097 fathoms. These soundings appear to be devoid of authority; at all events they are quite wrong.*

A more reliable map is, however, to be found in the same work.† This map, designed by Petermann and drawn by Habenicht, is, unfortunately for our purpose, on a smaller scale than Berghaus' map. It shows Carpenter's Ridge jutting southward into the 2000 fathom line immediately to the west of the Andamans; shows comparatively shallow water (between the 100 and the 1000 fathom lines), in the two channels between the Andamans and Sumatra, and indicates a depth of 1137 fathoms in Lon. 96° 11′ E. and in Lat. 12° 24′ N.—practically the situation of Berghaus' 2097 fathom mark; this sounding indicated by Petermann has the advantage of being a real one. Going further into detail however, one finds that not even Petermann's map gives any idea of the true state of affairs within this sea.‡ For the 1000 fathom line is there shewn as enclosing a long and narrow trough half way between the Andamans and Tenasserim; the three peaks that have just been described are therefore shown as springing from a slope that trends upwards from the bottom of this trough to the Andaman ridge. Instead, however, of indicating a line to the eastward of these peaks the 1000 fathom line passes westward between Narcondam and Barren Island to within 30 miles of the east coast of Middle Andaman, where soundings of 1130 and 1159 fathoms have been obtained; these, it may be remarked, close inshore though they be, have proved (with the exception of a veritable sounding of 1284 fathoms 50 miles east of little Nicobar, and of a doubtful sounding that gives 1260 fathoms with no bottom in Lon. 95° 30′ E, and Lat. 11° 45′ N.) the deepest soundings yet obtained in the Andaman Sea, and are more than 100 fathoms deeper than the deepest indicated along the line that connects Barren Island with Narcondam.

There is no doubt that taken collectively these three peaks indicate a northward continuation of the line of volcanic activity known as the "Sunda Range," which stretches up from Sambawa and Flores through Java and Sumatra at least to Barren Island. Von Buch in his work on

* In a previous paper (*Journ. As. Soc. Beng.* lx. pt. 2, p. 284) the writer was misled by these soundings, which he supposed to have some foundation, into giving the depth of the Andaman Sea as over 2,000 fathoms.

† Stieler's Hand Atlas, Sheet 58, dated 1884; scale 1 : 30,000,000.

‡ In criticising these maps the writer would wish it understood that it is from no desire to cavil that he points out their defects; it is only because they are worthy of criticism that reference is made to them. Except the Admiralty maps, which are above reproach, no English map with which the writer is acquainted deserves to be mentioned alongside of those in Stieler's work.

volcanoes did not carry the chain beyond Barren Island, but Griffith, who in passing Narcondam recognised its volcanic nature, suggested to McClelland that here might be seen a northward extension of the same chain. McClelland not only adopted the suggestion but sought a still further extension to the north, in the mud-volcanoes of Ramri and Cheduba, off the Arracan coast;* and other writers, such as Daubeny, Scrope, Mrs. Somerville and Mallett† have adopted the same view.

Ramri and Cheduba lie to the west of a tertiary ridge that composes the Yomah of Arracan, which, in the latitude of Ramri, reaches a height of 4,000 feet. This range is continued southward into and beyond the Andaman group. Thus it passes through Diamond Island to the Alguada reef, beyond this, across a channel less than 60 fathoms deep, to Preparis, and again across another of 150 fathoms to the Coco Group, Great Andaman and Little Andaman. It would appear after this to pass to the westward of the Nicobars, though its precise relationship to that group has not yet been made clear; finally it reappears, not in Sumatra, but in a long line of islands—the Nias group—that stretches south-eastward along the western coast of Sumatra.‡ The line of volcanic activity to which Barren Island and Narcondam presumably belong, lies from Narcondam southwards to the east of this tertiary ridge; if, therefore, Ramri and Cheduba belong to the same line, we have to believe that, after continuing for the whole length of Sumatra and the Andamans parallel to this ridge, the volcanic line at its northern end, where its activity is weaker than elsewhere, crosses the tertiary formations where they have become thicker and stronger. This is in itself a proposition, the truth of which is so hard to accept, that when Blanford§ suggests that the true northern continuation of the Sunda volcanic range is to be found in the extinct Burmese volcano of Popah, and the extinct Yunnan one of Han-shuen-shan, we realise that he must be right, and are surprised that, after all, Mallet is inclined, in a modified sense, to favour the earlier view.|| The volcanoes of Ramri are of a different type from those of the Sunda Range; they belong to a series of gas vents, all of the same general character, though none of them so active as the Ramri ones. The Sitakund in Chittagong,

* McClelland, Journ. As. Soc. Beng., vii., 77.

† Mallet does this (Records of the Geol. Survey of India, xi., 203) in a different sense from the earlier writers; they, owing to a want of definiteness in the accounts on which they relied, mistook the "gas" volcanoes of the Arracan Coast for true "steam" volcanoes.

‡ Kurz: Journ. As. Soc. Beng., xlv., pt. 2, 105.

§ Manual of the Geology of India, iii., 725.

|| Mallet: Memoirs of the Geol. Survey of India, xxi., 253.

and the various hot springs in the valley of Assam, like those in the Namba Forest,* are examples of this series, which forms a continuous line parallel on its western side to the tertiary ridge referred to, just as the true volcanoes, to the line of which Barren Island, Narcondam and Popah belong, are parallel to it on the east.†

Whether they belong to that particular group of volcanoes known as the Sunda Range, or not, there is no doubt that Narcondam and Barren Island belong to the general volcanic system extending from the Kuriles, through Japan and the Philippines, to Malaya—a system of which the Sunda Range itself forms but a portion. Like the other members of this system, these peaks are situated, not on, but just within, the margin of the continental elevation forming Eastern and South-Eastern Asia, wherever this rises abruptly from great ocean-depths; the main difference between them and most of the peaks of the system is that, whereas the space between the edge of the continental area and the line of volcanic activity is in other cases sub-aërial, that space is here for the most part sub-marine. This space forms, in the case of Sumatra, the main body of the island—the volcanic line being much nearer the eastern margin—and the rocks of which it is composed include all those that go to form the islands of the Nicobar Group; these rocks appear once more, not in the main chain of the Andamans, but in the small islands to the east of South Andaman (north-east of Port Blair) known as "The Archipelago."‡ Neither in, nor opposite, the Nicobars is there any trace of the complementary volcanic ridge; to the east of this "Archipelago," however, it is indicated by Flat Rock and Barren Island.

Not only is the volcanic line of Sumatra absent from the Nicobars, but no trace has yet been found in that group of the sandstones of the Arracan hills, which are prolonged into the main chain of the Andamans and which reappear in the Nias. The result, therefore, is that the Arracan-Sumatra chain, in place of constituting a single ridge consists

* Prain: Proceedings As. Soc. Bengal, 1887, p. 201.

† The reasons for thinking that the northward prolongation of the Sunda Range has not crossed the Arracan-Andaman ridge are, therefore:—

1. That the volcanoes on the west side of that ridge, which are supposed to continue the Sunda line, are of a different type from the volcanoes of the Sunda Range.

2. That these western volcanoes in Ramri belong to a system of vents of the same type as themselves, characterised by a linear distribution parallel to the western base of the Arracan-Andaman tertiary ridge.

3. That the Sunda Range is continued northward by a series of vents of the same type throughout, the character of linear distribution parallel to the eastern base of the Arracan-Andaman tertiary ridge being maintained unaltered.

‡ Oldham: Records of the Geol. Survey of India, xviii., 141.

of two—a western tertiary ridge most marked in the north and tailing off towards the south, and an eastern volcanic ridge most marked in the south and dwindling into insignificance northwards.

The question whether the line in which Narcondam, Barren Island, and Flat Rock are situated consists of a series of isolated peaks, or if these peaks are only the sub-aërial portions of a continuous ridge, remains to be considered. Such evidence as there is appears to indicate that they are situated on a ridge: it is not, however, at all complete. It has already been remarked that the soundings on a line passing north-north-east from Narcondam are relatively shallower than those on any other line. This has been explained by Carpenter as perhaps indicating that the deltaic shelf of the Irrawady extends as far out as Narcondam.* It may be anticipated that this will not be found a sufficient explanation of the phenomenon. It will be observed that the soundings gradually deepen for a space of $9\frac{1}{2}$ miles, till the bottom carries 362 fathoms, and that beyond this point it gradually shallows till the coast of Pegu is reached. If Narcondam were situated on the edge of a delta-shelf, one would expect that the soundings would not show so great a dip within its margin, and would further expect that soundings on lines carried at right angles to the line under discussion would give some indication of a more or less level area. Yet what we do find is that, before four miles to the east or three miles to the west of the island have been reached, greater depths have been obtained than the deepest sounding on the north-north-east line. This appears to indicate that Narcondam is not so much on the edge of a shelf, as at the end of a ridge that runs towards and into the Pegu coast-line. That this ridge is overlaid by the deltaic mud to within ten miles of Narcondam, and that the presence of this mud explains the gentle slope from its deepest point upwards to the Pegu coast is no doubt true; but the steady rise during the last ten miles towards Narcondam, coupled with the more abrupt dips to the east and to the west, indicate the existence of a ridge. The matter is capable of direct demonstration: a few lines of deep-sea soundings co-ordinate to the line of soundings taken towards the north-north-east, will disclose the true state of matters. It would also be equally easy, by making a line of borings along the continuation of its line, and a few co-ordinate lines across in the mud of the Irrawady delta, to demonstrate whether the supposed ridge passes subterraneously into Burma.

The same comparative shallowness is indicated by the line of soundings to the south-south-west of Barren Island, and to explain the fact Mallet† suggests the possibility of eruptions of ash distributed

* Carpenter: Records of the Geol. Survey of India, xxi., 48.

† Mallet: Records of the Geol. Survey of India, xxi., 47.

in this particular direction by the action of currents. It would seem easier, however, to explain these soundings by supposing that Barren Island formed the northern termination of a ridge on which Flat Rock, with Invisible Bank, is situated. Here, too, the matter is easily capable of demonstration: soundings on a line bearing from Barren Island to Flat Rock, with one or two transverse lines of soundings will show whether such a ridge exists.

The hypothesis that in Narcondam we see a continuation of the Sunda line of volcanic activity is not invalidated by the depth of the soundings between it and Barren Island. We know that there is a much deeper gap than this between two members of the same chain: in the well-known rift between Bali and Lombok, though the islands mentioned are only 15 miles apart, the narrow strait between is 2,100 fathoms deep.* And as a matter of fact, though the ridge is here deeper, it is by no means absent, for a sounding on the line bearing from Narcondam on Barren Island gives only 1,010 fathoms, while soundings to the west of that line, and between the supposed ridge and the Andamans, give 1,140, 1,159, and 1,130 fathoms. Though our knowledge of the bottom contour of the southern part of the Andaman Sea—the portion to the east of the Nicobars—is very defective, the little that we know bears out the hypothesis of an eastern as well as a western ridge. At a point 50 miles east of Little Nicobar a sounding of 1,284 fathoms is recorded, while 30 miles further east the bottom is only 1,000 fathoms deep. Then north of Pulo Rondo, in Lon. 95° 10′ E., the depth is 990 fathoms, while 20 miles further east it is only 930 fathoms. These soundings of 930 and 1,000 fathoms not improbably indicate the ridge on which Flat Rock, Barren Island, and Narcondam are situated. The 990 and 1,284 fathom soundings must indicate the trough between the ridges; for to the west of the latter lies the Nicobar Group, and to the west of the former, in Lon. 94° 20′ E., we find a depth of 975 fathoms, doubtless indicative of the western or Indian Ocean slope of the Nicobar-Sumatra ridge, since 25 miles further north, in Lon. 94° 26′ E., we have a sounding of 760 fathoms indicating the crest of that ridge. The soundings referred to are shown on the two maps that accompany this paper.

There is, perhaps, some connection between the depth of the rift separating Narcondam from Barren Island, and the fact that from Barren Island itself southwards the volcanoes either still are, or have till recently, been active, while those from Narcondam northwards have long been extinct. This has a certain bearing on another controverted point. Von Buch, as has been already stated, recognised the Sunda volcanic line

* Wallace, Island Life, 423 (map).

as extending to, but not beyond, Barren Island. To Blanford is due the merit of having upset the fanciful hypothesis of the further extension of the line across the Arracan Yomah, and of having suggested its probably true northern continuation. More recently it has been proposed* by Berghaus and others to sub-divide the extended Sunda line of Blanford into a Sunda Range proper, ending at the northern limit of Sumatra, and a Pegu Range, containing Barren Island, Narcondam, Popah and Han-shuen-shan. But it is obvious that if any sub-division be necessary, the one proposed by Berghaus is erroneous. A sudden deep gap in the line, with the further character of activity to the south of it, and non-activity to the north, is a much more natural cleavage than merely a number of miles of intervening sea, the nature of whose bottom is unknown or has been misunderstood. If therefore Berghaus be justified in differentiating a Pegu Range, it is clear that Barren Island must be excluded from it, and that we must return to Von Buch's view, that Barren Island is the most northerly member of the Sunda Range. The Pegu Range of very old and long extinct volcanoes begins then at Narcondam, and extends at least as far as south-western Yunnan.

The biological interest of these islands is not so great as the physiographical, because, whether the ridge here postulated exists or not, there is little doubt that these sub-aërial portions never have been connected with any of the adjacent lands. If Flat Rock has ever been sub-aërial, and in a fit condition to shelter air-breathing creatures and support vegetation, it is so no longer; how great soever may be the antiquity of the outer cone of Barren Island, it is probable from its configuration, that at one time it has been the scene of a catastrophe like that which in 1883 devastated Krakatau and totally destroyed its animal and vegetable life. The only one that, from its topography, has evidently remained for many ages in its present condition is Narcondam. Already the writer has laid before this society some notes on the Fauna of the islands †; it remains now to be seen whether the biological facts indicated by their Flora are in agreement with the deductions that should follow from their physiographical configuration.

All the plants found in the two islands are enumerated in the list that follows; running numbers are added to the locality so as to show at a glance how many species occur in each. In the discussion that succeeds the list the peculiarities of each island are dealt with before their common characteristics are considered.

* Stieler: Hand Atlas, sheet 8.

† Prain: Proceedings Asiat. Soc., Bengal, 1892, p. 109.

Plants collected in Narcondam and Barren Island.

I. MENISPERMACEÆ. I.

1. Anamirta Cocculus W. & A. Narcondam (1).
India, Indo-China, Malaya.
2. Cyclea peltata H. F. & T. Barren Island (1).
Andamans, Nicobars, Burma,
3. Antitaxis calocarpa Kurz. Narcondam (2), common.
Andamans and Nicobars.

II. CAPPARIDEÆ. II.

4. Capparis sepiaria Linn., *var.* grandifolia Kurz. Narcondam (3); Barren Island (2); common.
Andamans, Burma, Malaya; the variety does not occur in India.
5. Capparis tenera Dalz., *var.* latifolia H. f. & T. Narcondam (4).
Andamans, Tenasserim; the variety does not occur in India.

III. VIOLARIEÆ. —.

6. Alsodeia bengalensis Wall. Narcondam (5).
Assam, Burma, Andamans, Nicobars.

IV. GUTTIFERÆ. —.

7. Calophyllum inophyllum Linn. Narcondam (6); beach-forest.
Mascarene Isds.; S. E. Asia; Australia; Polynesia.

V. MALVACEÆ. III.

8. Hibiscus tiliaceus Linn. Narcondam (7); Barren Island (3).
Cosmopolitan on tropical sea-shores.
9. Thespesia populnea Corr. Narcondam (8).
On tropical coasts throughout the Eastern Hemisphere.
10. Bombax insigne Wall., *var.* polystemon Prain; *var. nov.* caudice armata, foliolis 7–9, sessilibus anguste lanceolatis, subtus glaucescentibus, staminibus plurimis (circa 700); capsula 3·5–4 poll. longa: floribus rubris. Narcondam (9); common.
India, Indo-China, Andamans, Malaya; this variety endemic.

There has been some confusion as regards the Asiatic species of *Bombax*; the writer, therefore, takes this opportunity of giving diagnoses of all of them. His excuse for doing so in this place, is that it was the difficulty of localising this tree that led to the study of the genus.

Bombaces Asiaticæ.

Arbores (ordinis Malvacearum) grandes, saltem juniores caudice armatæ foliis digitatis; calyce coriaceo; stylo simplici; fructu capsulari, segmentis 5; seminibus lana endorcarpii involutis.

Fructus segmentis crassissime coriaceis, seminibus sarcinis

lanæ propriis distincte involutis; cortice diu viridi: tubo staminali 1-seriali, segmentis 5, 1–3-antheris, petalis alternis; floribus minoribus sordide luteo-albis... *Bombax pentandrum* (*Eriodendron anfractuosum*).

[In India peninsulari et in insulis Andamanensibus, indigena et sylvestris; in India boreali, in Indo-China et præsertim in Malaya late culta et forsan inquilina.]

Fructus segmentis ligneis, lana endocarpii vix in sarcinis distinctis segregata; cortice mox cinerascente; floribus maximis, sæpissime rubris:—

Tubo staminali 5-seriali, serie interiori segmentis 5, 2-antheris, petalis alternis, cum serie altera staminibus simplicibus, 1-antheris, 10 per paria petalis oppositis fascem centralem stylum amplectentem formante; ceteris in phalangibus 2-cruralibus 5, petalis oppositis dispositis, staminibus phalangium singularum sub-12, omnibus binis 1-antheris; foliolis longius petiolulatis, laminis acuminato-caudatis subtus viridibus; stylo longibrachiato; capsula velutina ..... *Bombax malabaricum.*

[In India peninsulari et boreali, in China australi et Indo-China, in archipelagine Malayana, insulis Philippinensibus et Australia boreali-orientali frequens.]

Tubo staminali multiseriali, staminibus omnibus binis 1-antheris, serie interiori (forsan cum serie *altera* tantum speciei præcedentis comparanda) staminibus 20 petalis oppositis annulum stylum amplectentem formante; ceteris in phalangibus 2-cruralibus 5, petalis oppositis dispositis, staminibus phalangium singularum numerosis; foliolis breve petiolutatis vel sessilibus, laminis acutis; stylo brevibrachiato; capsula glabra ..... *Bombax insigne.*

[In India peninsulari occidentali; in Indo-China et in Malaya.]

Bombax pentandrum and *B. malabaricum* are wonderfully uniform in the number and arrangement of the elements of their staminal whorl; *B. insigne*, while equally uniform as regards the arrangement, varies considerably as regards the number of stamens in its phalanges. The subjoined key shows the distinguishing features and relative position of the most important of these varieties.

Tubo staminali ovario plus duplo longiore foliolis subsessilibus late lanceolatis, subtus viridibus glabris; floribus albis; (capsula ignota) ..... *Bombax insigne*, SUB.-SP. *anceps* (*B. anceps* Pierre). *B. malabarici* var. *albiflora* Wall. [Cat. n. 1840/3 et 1840/4] vel ad hanc sub-speciem, vel ad *B. insignis* genuini var. *album* referenda est.

[Burma (Shan); Cochin-China.]

Tubo staminali ovario vix longiore ..... *Bombax insigne*, SUB.-SP *genuina*.

Staminibus phalangium cruralibus utrinque circa 20:—

Staminibus phalangium singularum inter-cruralibus circa 30, capsula (unius ignota), 10–12-pollicari:—

Foliolis subsessilibus late lanceolatis vel obovato-mucronatis, subtus glaucescentibus; floribus rubris ..... var. *typica* (*B. insigne* Wall.; *B. festivum* Wall. [Cat. 1841]).

[Chittagong; Arracan; Pegu.]

Foliolis subsessilibus late lanceolatis, subtus viridibus glabris; floribus albis ..... var. *alba* (*Salmalia malabarica* Hort. Bogor., *nequaquam* Schott).

[Java, culta; forsan Burma (*vide supra B. anceps*).]

Foliolis breve petiolulatis anguste lanceolatis, subtus glaucescentibus; floribus rubris ..... var. *andamanica*.

[Andamans; ins. Cocos].

Foliolis breve petiolulatis anguste lanceolatis, subtus puberulis; (florum colore ab autore neglecto; capsula ignota) ..... var. *cambodiensis* (*B. cambodiense* Pierre.

[Cambodia.]

Staminibus phalangium singularum intercruralibus circa 50, capsula 10–12-pollicari, foliolis subsessilibus late lanceolatis, floribus rubris ..... var. *Wightii*.

[India; in prov. Kanara, Anamallai, Malabar.]

Staminibus phalangium singularum intercruralibus circa 90; capsula 3–4-pollicari tantum; foliolis sessilibus anguste lanceolatis, subtus glaucescentibus; floribus rubris ..... var. *polystemon*.

[Narcondam.]

Staminibus phalangium cruralibus utrinque 10; phalangium singularum intercruralibus circa 30; capsula 10–12-pollicari; foliolis breve petiolulatis

lanceolatis subtus viridibus glabris,
floribus viridescentibus ..... var. *larutensis*.
[Perak ; prov. Larut : forsan etiam in archipelagine Malayana apud Priaman].

It will be noted that the writer is unable to perpetuate the generic rank (*Eriodendron*) assigned by DeCandolle to the Linnean *Bombax pentandrum*. When the differences in the staminal columns of the three 'species' here recognised are reduced to the simplest possible terms, we observe that in *B. pentandrum* this whorl consists of but one element, the items of which are alternate with the petals ; that in *B. insigne*, likewise, there is but one element, the items of which are opposite the petals ; that in *B. malabaricum*, on the other hand, both these elements occur. Either, therefore, *Bombax malabaricum* and *Bombax insigne* typify two genera as distinct from each other as *Eriodendron* is from either ; or, as is here proposed, all three are congeneric. In another place the writer hopes to show that he is right in thinking, with Schumann, that *Pachira* does not deserve to be removed generically from *Bombax* ; that he is justified in further reducing *Chorisia* to *Eriodendron*, and therefore also to *Bombax* ; and is entitled to believe, with Willdenow, that the characters which separate *Adansonia* from *Bombax* are too trivial to be generic.

On the other hand, it will be noted that the material of some of the forms included in *B. insigne* is not yet complete, and it will be readily understood that writers who recognise as distinct the 'genera' referred to in the preceding paragraph, will be still more apt to treat as specifically separable the various forms of *B. insigne* here defined. No work on Indian Botany hitherto published notes *B. insigne* as Indian ; the tree, when mentioned, is stated to occur only in Indo-China.

VI. STERCULIACEÆ. IV.

11. STERCULIA RUBIGNIOSA Vent., *var.* GLABRESCENS King. Narcondam (10) ; Barren Island (4).

Andamans and Nicobar coasts, general ; the variety only.

—. *HERITIERA LITTORALIS* Dryand. Narcondam, fruits on beach, E. Bay ; Barren Island, fruits on beach at Landing-place Cove : not found growing in either island.

VII. TILIACEÆ. —.

12. GREWIA LÆVIGATA Vahl. Narcondam (11) ; in leaf only.
Africa ; India, Burma, Malaya ; Australia.

VIII. RUTACEÆ. —.

13. GLYCOSMIS PENTAPHYLLA Corr. Narcondam (12).
India, Indo-China, Malaya.

IX. BURSERACEÆ. V.

14. GARUGA PINNATA Roxb. Narcondam (13) ; Barren Island (5) ; in both islands common.

India, Burma, Malaya.

—. *CANARIUM EUPHYLLUM* Kurz. Narcondam ?

The leaves of this species occur in Herb. Calcutta, and are given as from

Narcondam, on the authority of the Andaman Deputation of 1866, by whom the specimen was collected; the writer did not see the tree in 1891. As the deputation visited the Coco Group (where the species does occur) as well as Narcondam, and as there are many other errors of locality on the tickets of their collection, the species, though here mentioned, is not formally included in the list.

x. MELIACEÆ. —.

15. Amoora Rohituka W. & A. Narcondam (14).
India, Burma, Malaya.
16. Amoora decandra Hiern. Narcondam (15).
Central and Eastern Himalaya; Malaya.
—. *Carapa moluccensis* Lamk. Narcondam; seeds on beach, E. Bay.

xi. OLACINEÆ. —.

17. Cansjera Rheedei Gmel. Narcondam (16).
India, Burma, Malaya; N. Australia; S. China.
18. Apodytes andamanica Kurz. Narcondam (17).
Andamans.

xii. RHAMNEÆ. vi.

19. Colubrina asiatica Brogn. Narcondam (18); Barren Island (6).
Africa; India and Ceylon; Burma, Malaya; N. Australia.
20. Gouania leptostachya Brogn. Narcondam (19), very plentiful.
India, Burma, Malaya.

xiii. AMPELIDEÆ. vii.

21. Vitis repens W. & A. Barren Island (7), very common.
India, Burma, Malaya.
22. Vitis carnosa Wall. Narcondam (20), common.
India, Burma, Malaya.
23. Vitis lanceolaria Roxb. Narcondam (21).
India, Indo-China, Malaya.
24. Leea sambucina Willd. Narcondam (22); Barren Island (8).
India, Burma, Malaya.

xiv. SAPINDACEÆ. viii.

25. Erioglossum edule Bl. Narcondam (23), common; Barren Island (9).
India, Burma, Malaya; N. Australia.
26. Allophylus Cobbe Bl. Narcondam (24), at Coco Bay.
India, Burma, Malaya.
27. Dodonæa viscosa Linn. Barren Island (10), common in the valley south of the lava.
Cosmopolitan in the tropics.

XV. ANACARDIACEÆ. IX.

28. Odina Wodier Roxb. Narcondam (25), very common.
India, Indo-China.

29. Semecarpus heterophylla Bl. Narcondam (26); Barren Island (11).
Indo-China, Andamans, Malaya.

XVI. LEGUMINOSÆ. X.

30. Desmodium polycarpon DC. Narcondam (27); Barren Island (12).
East Africa; S.-E. Asia; Polynesia; Japan and China.

31. Abrus precatorius Linn. Narcondam (28); Barren Island (13).
Cosmopolitan in the tropics.

32. Erythrina indica Lamk. Narcondam (29), coast, Anchorage Bay.
India, Burma, Malaya.

33. Mucuna gigantea DC. Narcondam (30), common.
India, Indo-China, Malaya; Polynesia.

34. Canavalia turgida Grah. Narcondam (31), Coco and East Bays.
India, Indo-China, Malaya.

35. Vigna lutea A. Gray. Narcondam (32), on coast.
Cosmopolitan in the tropics.

36. Phaseolus adenanthus G. F. Mey. Narcondam (33), abundant on beach at East Bay.
Cosmopolitan in the tropics.

37. Dalbergia tamarindifolia Roxb. Barren Island (14).
India, Indo-China, Malaya.

38. Dalbergia monosperma Dalz. Narcondam (34), coast north of Anchorage Bay.
India, Indo-China, Malaya; Australia; China.

39. Derris scandens Benth. Narcondam (35), East Bay, in sea-fence.
India, Indo-China, Malaya; Australia; China.

40. Pongamia glabra Vent. Barren Island (15), one tree behind the beach at the landing-place, and close to the lava.
Mascarene Isds; India, Indo-China, Malaya; Australia; Polynesia.

41. Cæsalpinia Bonducella Flem. Narcondam (36), Coco Bay.
Cosmopolitan in the tropics.

42. Entada scandens Benth. Narcondam (37).
Cosmopolitan in the tropics.

43. Acacia concinna DC. Narcondam (38); Barren Island (16); common.
India, Indo-China; China.

XVII. COMBRETACEÆ XI.

44. Terminalia Catappa Linn. Narcondam (39); Barren Island (17).
Andamans, Malaya.

This is comparatively scarce in Narcondam, but on Barren Island it is un-

doubtedly the most numerously represented tree present. Though really a littoral species, it is not here confined to the shore, but extends from base to summit of the outer cone on both sides wherever there is soil suitable for it to grow. Its general dispersal in the island has been largely assisted by the rats; they carry off the fruits in order to eat the fleshy outer portion.

45. Gyrocarpus Jacquinii Roxb. Narcondam (40).
Africa; India, Indo-China, Malaya; Polynesia: not in the Mascarene Islands or E. Africa.

xviii. MYRTACEÆ. xii.

46. Eugenia Jambolana Linn. Barren Island (18), very common.
India, Indo-China, Malaya; Australia.

47. Barringtonia speciosa Forst. Narcondam (41).
Ceylon; Andamans, Malaya; Australia; Polynesia.

The fruits of this species were picked up on the beaches in Barren Island, but the tree itself was not found growing.

xix. MELASTOMACEÆ. —.

48. Memecylon edule Roxb. Narcondam (42).
Ceylon; Indo-China, Andamans, Malaya; Philippines.

xx. CUCURBITACEÆ. —.

49. Trichosanthes palmata Roxb. Narcondam (43).
India, Indo-China, Malaya; Australia; Japan and China.

xxi. RUBIACEÆ. xiii.

50. Oldenlandia corymbosa Linn. Barren Island (19), in the crater.
America; Africa; India, Indo-China, Malaya.

51. Mussænda macrophylla Linn. Barren Island (20), common.
Indo-China, Andamans.

This plant, which is common in the valley between the cones, close to the lava, is one of the species reported by the Deputation of 1866; flowering specimens collected then are preserved in the Calcutta Herbarium, but are noted as being from Narcondam, not Barren Island. The species does not appear to occur in Narcondam, for the plant was carefully looked for there. The mistake on these tickets, which requires to be pointed out, since some of the specimens collected in 1866 may have reached Herbaria in Europe, is nevertheless a fortunate one, as it first called the attention of the writer to the fact that, though this Deputation only reported on Barren Island (*Proc. As. Soc., Beng.*, 1866, 215), it visited Narcondam also. The interest of this fact will be shown in discussing the presence of the Coco-nut.

The species has here, owing to its situation, developed a shrubby habit, but careful examination of the complete material obtained by the writer, leads him to conclude that it cannot be looked upon as even varietally distinct.

52. Guettarda speciosa Linn. Narcondam (44).
Cosmopolitan in the tropics.

53. Ixora brunnescens Kurz. Narcondam (45), and Barren Island (21); common on the coasts.
Andamans.

54. Ixora cuneifolia Roxb. Barren Island (22), within outer cone.
Indo-China.

55. Morinda citrifolia Linn., *var.* bracteata H. f. (sp. Roxb.) Narcondam (46), very common everywhere, from sea-level to the top of the hill, at 2300 feet elev.; Barren Island (23), common.
India, Indo-China, Andamans.

56. Pæderia fœtida Linn. Narcondam (47).
India, Burma, Malaya.

xxii. COMPOSITÆ. xiv.

57. Vernonia divergens Benth. Narcondam (48), on coast.
India, Indo-China.

58. Blumea glomerata DC. Narcondam (49), rocks, west coast.
India, Indo-China, Malaya; China.

59. Blumea laciniata DC. Narcondam (50), rocks east coast.
India, Indo-China, Malaya; China.

60. Blumea myriocephala DC. Narcondam (51), at 1500–1800 feet.
Eastern Himalaya, Indo-China, Andamans.

61. Pluchea indica Less. Narcondam (52), and Barren Island (24), on coasts; common.
India, Indo-China, Malaya; China.

62. Wedelia scandens C. B. Clarke. Narcondam (53), common on coasts; Barren Island (25), coasts.
India, Indo-China, Malaya.

xxiii. GOODENOVIEÆ. xv.

63. Scævola Kœnigii Vahl. Narcondam (54); Barren Island (26).
India, Indo-China, Malaya; Australia; Polynesia.

xxiv. MYRSINEÆ. xvi.

64. Ardisia humilis Vahl. Narcondam (55); Barren Island (27).
India, Indo-China, Malaya; China.

xxv. SAPOTACEÆ. —.

65. Sideroxylon ferrugineum H. & A. Narcondam (56).
Malaya, Andamans; China.

This is another of the species obtained by the Deputation of 1866: on this occasion the labels are correct. The form present here has unusually large leaves—in young trees they are 30 in. long by 12 in. across.

66. Diospyros Kurzii Hiern. Narcondam (57).
Andamans and Nicobars.

xxvi. APOCYNEÆ. xvii.

67. Aganosma marginata G. Don. Barren Island (28), very common in the valley between the cones, to the south of the lava.
Indo-China, Malaya.

68. Anodendron paniculatum A. DC. Narcondam (58).
India, Indo-China, Malaya.

xxvii. ASCLEPIADACEÆ. xviii.

69. Tylophora globifera H. f. ? Narcondam (59); in fruit only.
Andamans.

70. Hoya parasitica Wall. Narcondam (60); Barren Island (29).
Indo-China, Malaya.

71. Hoya diversifolia Bl. (*H. orbiculata* Wall.) Narcondam (61); Barren Island (30).
Indo-China, Malaya.

72. Dischidia nummularia R. Br. Narcondam (62).
Indo-China, Malaya; Australia.

xxviii. EBENACEÆ. xix.

73. Mitreola oldenlandioides Wall. Barren Island (31), abundant underneath a thicket of gregarious *Flueggia* to the north of the lava at Landing-place Cove; not seen elsewhere.
India, Burma, Malaya; N. Australia.

74. Strychnos acuminata Wall. Narcondam (63), once at 1600 feet.
Burma, Andamans.

xxix. CONVOLVULACEÆ. xx.

75. Ipomœa grandiflora Lamk. Narcondam (64); Barren Island (32).
East Africa; India, Indo-China; Malaya, Australia, Polynesia.

76. Ipomœa denticulata Choisy. Narcondam (65), at East Bay.
Mascarene Islands; Laccadives and Ceylon; Andamans, Indo-China, Malaya; Australia, Polynesia.

77. Ipomœa turpethum R. Br. Narcondam (66), in the bed and round the edges of a small dry lagoon in the beach-forest at East Bay.
Mascarene Islands; India, Indo-China, Malaya; Australia, Polynesia.

78. Ipomœa biloba Forsk. Narcondam (67); Barren Island (33).
Cosmopolitan in the tropics.

79. Ipomœa vitifolia Sw. Narcondam (68), Coco Bay, abundant.
India, Burma, Malaya.

80. Convolvulus parviflorus Linn. Narcondam (69), Anchorage Bay.
Africa; Indo-China, Malaya; Australia.

—. SOLANACEÆ. XXI.

81. PHYSALIS MINIMA Linn. Barren Island (34), on a small landslip on outer cone, south of Landing-place Bay.
Cosmopolitan in the tropics.

—. SCROPHULARINEÆ. XXII.

82. VANDELLIA CRUSTACEA Benth. Barren Island (35), on the small landslip, and also inside the crater.
Africa; India, Indo-China, Malaya; Australia, Polynesia; China.

XXX. BIGNONIACEÆ. XXIII.

83. OROXYLUM INDICUM Vent. Narcondam (70); Barren Island (36).
India, Indo-China, Malaya.

XXXI. ACANTHACEÆ. XXIV.

84. ERANTHEMUM SUCCIFOLIUM Kurz. Narcondam (71); Barren Island (37).
Andamans, Nicobars.

XXXII. VERBENACEÆ. XXV.

85. CALLICARPA ARBOREA Roxb. Narcondam (72); Barren Island (38).
India, Burma, Malaya.

86. PREMNA INTEGRIFOLIA Linn. Narcondam (73); Barren Island (39).
India, Indo-China, Andamans.

87. CLERODENDRON INERME Gærtn. Narcondam (74), at East Bay.
India, Indo-China, Andamans.

XXXIII. NYCTAGINEÆ. XXVI.

88. BOERHAAVIA REPENS Linn. Narcondam (75); Barren Island (40); common on rocks on the coast.
Cosmopolitan in the tropics.

89. PISONIA ACULEATA Linn. Narcondam (76), not very plentiful.
Cosmopolitan in the tropics.

90. PISONIA ALBA Span. Narcondam (77), beach-forest, E. Bay.
Laccadives, Ceylon; Andamans, Malaya.

91. PISONIA EXCELSA Bl. Narcondam (78), abundant, E. Bay.
Andamans, Malaya.

XXXIV. ARISTOLOCHIACEÆ. —.

92. ARISTOLOCHIA TAGALA Cham. & Schlecht. Narcondam (79).
India, Indo-China, Malaya; China.

XXXV. MYRISTICACEÆ. —.

93. MYRISTICA GLAUCA Bl. Narcondam (80).
Indo-China, Andamans, Malaya.

XXXVI. EUPHORBIACEÆ. XXVII.

94. Bridelia tomentosa Bl. Narcondam (81).
India, Indo-China, Malaya, Australia, China.

95. Actephila excelsa Muell.-Arg. (*A. javensis* Miq.) Narcondam (82); gregarious and plentiful, the commonest species in the island.
India, Burma, Malaya.

96. Phyllanthus reticulatus Poir. Barren Island (41), to the south of the lava, near inner base of outer cone.
Africa; India, Burma, Malaya; China.

97. Glochichon calocarpum Kurz. Narcondam (83), and Barren Island (42); common on rocks on the coast.
Andamans and Nicobars.

98. Flueggia microcarpa Bl. Barren Island (43); gregarious and plentiful between the cones to the north of the lava.
Africa; India, Indo-China, Malaya; Australia; China.

99. Breynea rhamnoides Muell.-Arg. Narcondam (84).
India, Burma, Malaya; China.

100. Cyclostemon macrophyllus Bl. Narcondam (85).
India, Andamans, Malaya.

101. Cyclostemon assamicus Hook. f. Narcondam (86).
Eastern Himalaya, Assam; Andamans.

102. Blachia andamanica Hook. f. Narcondam (87), Anchorage Bay.
Andamans.

103. Mallotus andamanicus Hook. f. Narcondam (88), gregarious and common, but less so than *Actephila excelsa*.
Andamans.

104. Macaranga Tanarius Muell.-Arg. Narcondam (89); Barren Island (44).
Andamans, Malaya.

105. Gelonium bifarium Roxb. Narcondam (90), plentiful on the coast; Barren Island (45).
Andamans, Malaya.

XXXVII. URTICACEÆ. XXVIII.

106. Trema amboinensis Bl. Narcondam (91), common on rocky coasts and inland also; Barren Island (46), general, some stunted examples occur even on the bare inner cone.
Eastern Himalaya, Indo-China, Andamans, Malaya.

107. Ficus gibbosa Bl., *var.* cuspidifera King. Barren Island (47).
India, Indo-China, Malaya.

108. Ficus glaberrima Bl. Narcondam (92); one of the tallest trees.
Himalaya, Indo-China, Malaya.

109. Ficus Benjamina Linn. Narcondam (93); seeds brought have germinated at Calcutta.

India, Indo-China, Malaya.

110. Ficus retusa Linn., *var.* nitida King (*sp.* Thunbg). Narcondam (94), and Barren Island (48); very common on both islands.

India, Indo-China, Malaya; Australia; New Caledonia; China.

111. Ficus nervosa Roth. Narcondam (95), at 1,800 feet elevation.

India, Indo-China, Malaya; China.

112. Ficus Rumphii Bl. Narcondam (96), and Barren Island (49); very plentiful.

India, Indo-China, Malaya.

113. Ficus callosa Willd. Narcondam (97), beach-forest at East Bay; a very tall tree.

India, Indo-China, Malaya.

114. Ficus brevicuspis Miq. Narcondam (98), very common; Barren Island (50); this is one of those species in which many of the branchlets are hollow and afford homes for species of ants.

Andamans, Malaya.

115. Ficus hispida Linn., *var.* typica. Barren Island (51), in the valley between the cones, at the inner base of the outer cone.

India; Indo-China, Malaya.

var. dæmonum King (*sp.* Kœnig.). Narcondam (99), and Barren Island (51); frequent.

India, Indo-China, Malaya.

116. Ficus variegata Bl. Barren Island (52); on the hill at the west end of southern part of outer cone, overlooking Landing-place Bay.

Indo-China, Malaya.

117. Antiaris toxicaria Leschen. Narcondam (100), not common.

India, Burma, Malaya.

The leaves of the form present here exactly match those of Malayan specimens named *A. rufa* by Miquel.

118. Artocarpus Lakoocha Roxb. Narcondam (101).

India, Indo-China, Malaya.

119. Bœhmeria malabarica Wedd. Narcondam (102); very plentiful.

India, Indo-China, Malaya.

120. Pipturus velutinus Wedd. Narcondam (103), plentiful.

Nicobars, Malaya; Polynesia.

—. ORCHIDACEÆ. xxix.

121. Dendrobium sp. Barren Island (53), rather common on trees on inside of outer cone.

122. Pholidota imbricata Lindl. Barren Island (54), inside crater.
India, Burma, Malaya.

xxxviii. SCITAMINEÆ. — .

123. Musa sapientum Linn. The *Plantain.* Narcondam (104), a large grove behind the Coco-nut trees at Coco Bay.
Cosmopolitan in the tropics, cultivated.

No doubt deliberately introduced for the benefit of possibly ship-wrecked mariners, though it is not quite clear who planted it; probably (see under *Cocos nucifera*) it has been introduced from the Andamans, and perhaps dates from 1866.

xxxix. DIOSCOREACEÆ. xxx.

124. Dioscorea sativa Linn. Narcondam (105) Barren Island (55).
India, Burma, Malaya; Australia.

125. Dioscorea glabra Roxb. Barren Island (56); common.
India, Burma, Malaya.

xl. LILIACEÆ. xxxi.

126. Dracæna angustifolia Roxb. Narcondam (106), Anchorage Bay.
Indo-China, Malaya, Australia.

127. Gloriosa superba Linn. Barren Island (57), E. coast near sea.
Africa; India; Indo-China, Malaya.

xli. COMMELINACEÆ. — .

128. Pollia Aclisia Hassk. Narcondam (107), very abundant on slopes overlooking south end of Anchorage Bay.
Eastern Himalaya, Indo-China, Malaya.

xlii. PALMEÆ. xxxii.

129. Caryota mitis Lour. (*C. sobolifera* Wall.) Narcondam (108).
Indo-China, Malaya.

130. Cocos nucifera Linn. Narcondam (109), many at Coco Bay, a few at Anchorage Bay, one, not yet bearing, at E. Bay; Barren Island (58), thirteen trees counted from the offing, behind the *Pandanus* fence at Anchorage Bay; none seen elsewhere.
India; Malaya; Polynesia; America.

The introduction of this tree into these islands is a question of some interest. The tree at E. Bay, Narcondam, has no doubt been produced from a nut washed round from Coco Bay; in all likelihood the trees at Anchorage Bay have been derived from the same source. The trees at Coco Bay itself may have originated from nuts brought from the Coco Group by a surface-current sweeping from the Sea of Bengal, through the Preparis Channels, from N.-E. to S.-W. across the Andaman Sea; but as they are associated, where they occur, with a grove of *Musa sapientum* (which must have been deliberately introduced), it is not unreasonable to suppose that the two species were introduced together.

The question is, when did they first appear? Hume and Ball landed in 1873 at the very spot where they are now so plentiful, yet no mention is made by either writer of their presence. As Ball speaks of some of the species observed at this Bay, and as Hume describes the Coco-nuts seen by him, shortly after, at the Cocos, it is hard to believe that the trees were there in 1873. Again, Mallet makes no reference to them in 1884; the maps accompanying his account indicate that he and Hobday landed at Anchorage Bay, and he may not therefore have seen the large grove at Coco Bay; but those at the beach where he landed should have been evident to him. Mallet's paper is however confined to the geology and topography of the island, and hardly alludes to its vegetation. But Hume, Ball, and Mallet are equally silent regarding the Coco-nuts on Barren Island which we know to have been present in 1866, for they were seen by the Andaman Deputation—whose report has been already referred to (p. 56)—behind a beach, to which they still seem confined. As these three writers failed to notice Coco-nuts in Barren Island, where we know they existed at the time of these visits, there is no reason why Coco-nuts should not have been present then in Narcondam also. The Andaman Deputation in their Report (*Proc. As. Soc., Beng.*, 1866, 215)., say: "We brought from Port Blair with "us a number of Cocoa-nuts, Plantain trees, and Pine-apple cuttings, and these "we planted on the ground from which the grass had been cut, in hopes that "they might be of use to some future visitors."* We have seen, in connection with some of the species in this list, that the same deputation visited Narcondam also, though it did not report on that island; nothing therefore is more probable than that the deputation did there what it had done on Barren Island, and that to its members belongs the credit of having introduced, at least, the Plantains. But the Coco-nut trees are so much more numerous, and so much larger on Narcondam than on Barren Island, that one finds it difficult to think they only date from 1866. It is unfortunate that the deputation did not find it necessary to report on Narcondam as well as on Barren Island; had they done so, there is little doubt the report would have mentioned any Coco-nuts that were present. However, even if the Coco-nut trees were already there in 1866, the writer is inclined to think that their origin must still be due to introduction by some previous visitor.

The Coco-nuts on Barren Island may be supposed to have originated from nuts swept up by a strong surface-current that flows from the south-west, and that therefore would bring drift from the Nicobars where Coco-nuts are plentiful. But it is more likely that the trees have been introduced, though involuntarily, by man. For though there is reason to believe that no one has ever landed at this particular beach, this bay affords the only safe anchorage in the island, and it is therefore more probable that these trees have sprung from nuts that have fallen overboard from

* There was no trace of any of these in the locality indicated during the writer's visit, a circumstance not surprising; because, in the first place, the situation is not over-suitable for such species, and, besides, goats have been since then introduced into the island! It may be mentioned that no one at Port Blair in 1891 knew of the existence of Coco-nuts in Narcondam, and the writer consequently took a number with him in order to plant them, only to find the act unnecessary. And, bearing in mind the state of affairs in Great Coco (*Journ. As. Soc., Beng.*, lx, pt. 2, 315), he also took fruits of *Carica Papaya* for the same purpose. Should, therefore, subsequent visitors find this species established in the island, they are hereby relieved of the necessity of inventing an hypothesis to explain the circumstance.

some craft lying off this beach, than that they have been brought by the sea from the Nicobars, or that they have been deliberately introduced by man.

XLIII. PANDANACEÆ. XXXIII.

131. PANDANUS ODORATISSIMUS Linn. f. Narcondam (110), common at Coco Bay and elsewhere; Barren Island (59), at Anchorage Bay.

India, Indo-China, Malaya.

XLIV. AROIDEÆ. —.

132. AMORPHOPHALLUS (*Candarum*) REX Prain, *sp. nov. tubere* magno depresso-globoso; *cataphyllis* 4, oblongo-lanceolatis; *folii* petiolo parum asperato vix maculato, lamina trisecta segmentis irregulariter dichotomis iterumque pinnatisectis, pinnulis (imis nonnunquam exceptis) ad costulas decurrentibus, ovato-oblongis, caudato-acuminatis, nervis supra impressis, subtus prominentibus, sinubus angustis; *pedunculo* crasso florifero brevi, fructigero elongato; *spatha* juniore cataphyllis obtecta, matura tubo infundibulari crasso in laminam late campanulatam margine tandem reflexa undulato-plicatam postice acuminatam expanso; *spadice* spatha subduplo longiore, erecto, stricto, crasso; *inflorescentiis* tubo spathæ subinclusis, *fœminea* sursum parum angustata quam *masculam* parum obconicam dimidio longiore, *appendice* crassa conico-pyramidali inflorescentiis dimidio longiore et, saltem prope basin, quam eas triplo latiore. Narcondam (111), very common.

Tubere diam. 9–18-poll.; *cataphyllis* spiraliter dispositis, imo exteriore 3 poll., altero 9 poll., tertio 12 poll, summo interiore 19 poll. longis, omnibus 2 poll. latis, pallide viridibus maculis olivaceis, demum tamen subconcoloribus luteis; *petiolo* 2·5–6-pedali basi ipsa 4·5 poll. crasso, sursum spatio brevi ita incrassato ut loco supra solum 4 poll. alto crassitudinis 5-pollicaris, deinde paullatim se coartante et apud trifurcationem diam. 3·5 poll. tantum, pallide viridi, maculis olivaceis, demum subconcolore olivaceo; *lamina* diam. 5·5-ped., supra olivacea subtus prasina, segmentis singulis 36 poll. longis, pinnulis ultimis 8–10 poll. longis, his 3–3·25 poll. latis; pedunculo florifero brevi, 2·5 poll. tantum longo, fructigero ad 30 poll. elongato, 1·5–2 poll. crasso, juniore pallide viridi maturo purpurascente; spatha a latere 16 poll., a basi ad apicem versus 19 poll. longa, infra substantiæ carnosæ sursum tenuescente, extus concolore pallide viridi, intus ad basin verruculosam lutea, supra pallide viridi ibi tamen margine excepto cito flavescente; *spadice* tota 21·5 poll. longa, parte *fœminea* 4·5 poll. longa, basi 2·25 poll. apice 1·75 poll. crassa, (fructigera 7 poll. longa et 3·5 poll. crassa) ex ovariis globosis 0·2 poll. diam. viridibus, 2-(rarissime 3-)locularibus, sessilibus, subcontiguis, in stylos 0·3 poll. longos, luteos contractis, stigmatibus plicatim 2–3-lobis, loculis 1-ovulatis, ovulis semianatropis decurvis, funiculo elongato angulo interiore parum supra basin affixis, in ala placentali circa basin funiculo exoriente et loculum fere totum complente innixis eademque amplexis; parte *mascula* 3 poll. longa, basi 1·75 poll., apice 2·5 poll. crassa, e floribus 4–5-antheris spiraliter dispositis, antheris singulis subsessilibus connectivo sursum parum producto, ellipsoideis sursum angustatis apice rimis lunulatis 2-porosis; *appendice* 14 poll. longa, hac basi 6 poll. crassa,

post anthesin caduca, spongiosa, rugosa, valleculosa, lutea et brunneo-maculata: *bacca* 1–2-sperma, 0·75 poll. longa, hac 0·25–0·35 poll. lata, ovata, versus apicem angustata, carnosa, lutea; *seminibus* pendulis ovatis, triente basilari e funiculo incrassato spongiosis, ceterum embryone corneo semini subconformi cartilageneis.

This species resembles the Java form, or a variety, of *Amorphophallus campanulatus* (*A. campanulatus* Blume, Rumphia, i, 139. t. 32, 33, as opposed to *Arum campanulatum*, Roxb, Hort. Beng., 66) in the conic-pyramidal shape of the appendix, but differs in other respects, more particularly in the leaf. It agrees with *A. virosus* Brown (*Bot. Mag.*, 6978) in having the male and female inflorescence of about equal length, but in other respects is very distinct, for *A. virosus* has the dense flowered turbinate male inflorescence, and the short oblong appendix characterstic of Roxburgh's *Arum campanulatum* of which it is probably only a form. The following brief diagnosis † may assist in indicating how very distinct the present plant is from the forms hitherto known :—

Petiole hardly verrucose; male flowers disposed spirally on an inflorescence not wider than the female: yellow pyramidal appendix (twice as long as broad, and) one-half longer than the combined inflorescences: (male and female inflorescences of equal length; spathe green concolorous) ..... *A. rex*

Petiole very verrucose; male flowers disposed spirally on an inflorescence much wider than the female: purplish-brown appendix not so long as the combined inflorescences:—

Male and female inflorescences of equal length, spathe green suffused with purple, externally white spotted (oblong appendix not longer than broad) ..... *A. virosus.*

Male inflorescence much shorter than the female, spathe purple concolorous ..... *A. campanulatus.*

Oblong appendix, not longer than broad ..... *Arum campanulatum* Roxb. (India).

Pyramidal appendix twice as long as broad *Amorphophallus campanulatus* Bl. (Java).‡

† In connection with this, it may be mentioned that the *Amorphophallus* from the Coco Group, mentioned (*Journ. As. Soc., Beng.*, lx, 2, 333) as related to *A. bulbifer* and *A. tuberculiger*, has since flowered at Calcutta, and has proved, as was then anticipated, to be a very distinct species. As the authors of the other species, have indicated by the specific name the tubercle-bearing habit of the species, the writer proposes for this one the name 'AMORPHOPHALLUS ONCOPHYLLUS' *Prain*. The diagnosis between it and the two species for which it might be mistaken, is as follows:—

Stigma sessile, spathe unconstricted, appendix equal in length to the combined inflorescences:—

Female inflorescence shorter than the male ..... *A. tuberculiger.*

Female inflorescence as long as the male ..... *A. bulbifer.*

Style distinct, spathe constricted slightly opposite the male inflorescence, appendix twice as long as the combined inflorescences ..... *A. oncophyllus.*

‡ As this paper has been passing through the press, the writer has learned from Sir Joseph Hooker, that he identifies *A. rex* with Blume's Java *A. campanulatus*.

133. Pothos scandens Linn. Narcondam (112), on trees; common.
India, Indo-China, Malaya.

xlv. CYPERACEÆ. xxxiv.

134. Cyperus pennatus Lamk. Narcondam (113); Barren Island (60).
Africa, India, Indo-China, Malaya.

135. Fimbristylis diphylla Vahl. Barren Island (61).
America; Africa; India, Indo-China, Malaya; Australia; China.

136. Fimbristylis ferruginea Vahl. Narcondam (114), rocks on coast; Barren Island (62), tussocks outside inner cone, also inside crater.
India, Indo-China, Malaya.

xlvi. GRAMINEÆ. xxxv.

137. Oplismenus Burmanni Roem. & Schult. Barren Island (63).
India, Indo-China, Malaya; China, Japan.

138. Thysanolæna acarifera Nees. Narcondam (115) coasts.
India, Indo-China; Malaya.

139. Pogonatherum saccharoideum Beauv. Barren Island (64); common.
India, Indo-China, Malaya; China.

This species is very abundant on the rocky slopes forming the inner side of the outer cone; it is one of the plants collected by the Deputation of 1866; it was also collected in 1846 by Kamphövener, botanist on the Danish Frigate "*Galatea*," whose visit is commemorated by the name '*Galatea*' having been marked on the large block on the crater. Kamphövener's specimens are in the Herbarium at Copenhagen.

140. Ischæmum muticum Retz. Barren Island (65); common.
India, Indo-China, Malaya; Australia; Western Polynesia.

Usually a coast species, this here extends inland and fills the valley between the cones, covering all the bottom of this except the lava streams.

—. LYCOPODINEÆ. xxxvi.

141. Lycopodium cernuum Linn. Barren Island, (66), interior of crater.
Cosmopolitan in the tropics.

142. Psilotum triquetrum Sw. Barren Island (67), interior of crater.
Cosmopolitan in the tropics.

xlvii. FILICES. xxxvii.

143. Davallia solida Sw. Narcondam (116), on trees in beach-forest.
Andamans, Malaya, Polynesia; Australia.

144. Davallia speluncæ Bak. Narcondam (117), common.
Africa; India, Indo-China, Malaya; Australia; Polynesia.

145. Adiantum lunulatum Burm. Barren Island (68), common.
Cosmopolitan in the tropics.

146. Trichomanes pyxidiferum Linn. Narcondam, (118), at 2330 feet.
Cosmopolitan in the tropics.

147. Cheilanthes tenuifolia Sw. Barren Island (69), dwarf specimens, plentiful within the crater.

India, Indo-China, Malaya; Australia; Polynesia; China.

148. Onychium auratum Kaulf. Barren Island (70), occasional.

Himalayas, Indo-China, Malaya; China.

149. Pteris longifolia Linn. Barren Island (71), a few plants.

Cosmopolitan in tropical and sub-tropical countries.

150. Pteris biaurita Linn. Barren Island (72), occasional.

Cosmopolitan in the tropics.

151. Asplenium Nidus Linn. Narcondam (119), on trees, rather common.

Mascarene Islands; India, Indo-China, Malaya; Polynesia.

152. Asplenium falcatum Lamk., *var.* urophyllum Bak. Narcondam (120), very common on stony hill-sides; Barren Island (73).

Africa; India, Indo-China, Malaya; Australia; Polynesia.

153. Nephrodium terminans J. Sm. Narcondam (121), common.

India, Indo-China, Malaya; Australia; Polynesia; China.

154. Nephrolepis tuberosa Presl. Barren Island (74).

Cosmopolitan in the tropics.

155. Polypodium irioides Lamk. Narcondam (122), at 1800 feet.

Africa, India, Indo-China, Malaya; Australia; Polynesia.

156. Polypodium adnascens Sw. Narcondam (123); Barren Island (75).

Africa, India, Indo-China, Malaya; Polynesia.

157. Polypodium quercifolium Linn. Narcondam (124); Barren Island (76).

India, Indo-China, Malaya; Australia.

158. Acrostichum appendiculatum Willd., *var.* setosa Bak. Narcondam (125), common.

India, Indo-China, Malaya.

159. Acrostichum costatum Wall., *var.* deltigera. Narcondam (126); exactly = Wallich's *Meniscium deltigerum*.

E. Himalayas; Indo-China, Malaya.

160. Acrostichum aureum Linn. Narcondam (127); and Barren Island (77); common on rocks on the coast.

Cosmopolitan in the tropics in salt marshes.

161. Acrostichum scandens J. Sm. Barren Island (78), near sea.

India, Indo-China, Malaya; Australia; Polynesia.

xlviii. MUSCI. xxxviii.

162. Neckera rugulosa Mitt.* Narcondam (128), at 2330 feet.

Ceylon.

* Examined, and kindly named for the writer by Dr. Brotherus, Helsingfors.

163. Bryum coronatum Schwægr. Narcondam (129); Barren Island (79). Cosmopolitan in the tropics.

xlix. LICHENES. xxxix.

164. Collema nigrescens Achar. Narcondam (130), rather common; Barren Island (80), plentiful.
Cosmopolitan.

l. FUNGI.* xl.

165. Polyporus australis Fries. Narcondam (131); Barren Island (81).
Cosmopolitan in the tropics.

166. Polyporus xanthopus Fries. Narcondam (132).
Cosmopolitan in the tropics.

167. Lenzites platyphyllus Cooke, *Grevillea* xiii. 1. Narcondam (132).
Malay Peninsula.

168. Dedaelea griercina Fries. Narcondam (134); Barren Island (82).
Cosmopolitan.

169. Peniophora papyrina Mont. Narcondam (135); Barren Island (83).
Cosmopolitan in the tropics.

170. Hirneola polytricha Mont. Narcondam (136); Barren Island (84).
Cosmopolitan in the tropics.

171. Thelephora incrustans Pers. Narcondam (137); Barren Island (85).
Cosmopolitan.

172. Rhytisma, sp. Narcondam (138); Barren Island (86); on leaves of *Ficus brevicuspis*.
Andamans.

ALGÆ. xli.

173. Calothrix pulvinata Ag. Barren Island (87); on stones in the hot spring on the beach at Landing-place Cove.
Cosmopolitan.

174. Calothrix tasmanica Kg. Barren Island (88); on rocks in bed of torrent on inside of outer cone to the south of the lava.
Indo-China, Malaya; Australia.

§§§ Nature and Origin of the Flora.

The list includes 174 species, of which 138 occur in Narcondam and 88 in Barren Island; 86, or $62\frac{1}{3}$°/₀, of the Narcondam plants are absent from Barren Island, while 36, or 41°/₀, of the Barren Island species do not occur in Narcondam; only 52 species—making $37\frac{3}{4}$°/₀ of

* Examined, and kindly named for the writer by Mr. G. Masseé.

the Narcondam, 59°/₀ of the Barren Island flora—are common to the two islands. Of the genera, 111 occur in Narcondam and 75 in Barren Island, but only 48,—43¼°/₀ of the Narcondam ones, 64°/₀ of those in Barren Island—are found in both places. Eleven natural orders present in Narcondam are unrepresented in Barren Island; five present in Barren Island are not found in Narcondam.

As regards *Cryptogams*, the two floras seem very similar, each having the same total number; the natural orders, however, indicate greater diversity of character among Barren Island than among Narcondam *Cryptogams*. There are two *Lycopodineæ*, and two *Algæ*, not represented in Narcondam; on the other hand, in Narcondam, at the top of the hill are a *Trichomanes* and a *Neckera*, absent from Barren Island. Of the thirteen ferns on Narcondam and 12 on Barren Island, 5 only are common to the two places; the Narcondam ferns belong to 6 genera, the Barren Island ones represent 8 genera. In Narcondam, one of the features of the vegetation is the presence of large beds of ferns; in Barren Island, ferns are scarce.

All the *Cryptogams* are herbaceous, and may all have their presence credited to wind-agency; *Acrostichum aureum*, however, in both islands, and *Acrostichum scandens* in Barren Island, grow only near the sea; both are denizens of mud-flats in the Sunderbuns, the Andamans and throughout Malaya and possibly therefore are sea-introduced.

Of the 46 natural orders of *Phanerogams* in Narcondam, 23 are represented by one species, 12 by two species, 3 by three species, and 3 by four species each; the only orders represented by more than four species, are *Compositæ* and *Convolvulaceæ*, each 6 sp.; *Euphorbiaceæ*, 10 sp.; *Leguminosæ*, 12 sp. and *Utricaceæ*, 13 sp. In the 35 natural orders in Barren Island we find that 21 are represented by one species, 8 by two species, and 2 by three species; the only orders represented by more than three species are *Leguminosæ*, *Rubiaceæ* and *Euphorbiaceæ*, 5 sp. each, and *Urticaceæ*, 7 sp. *Urticaceæ* is thus in both islands the leading natural order; this hegemony is due to the facilities that fruits of the order offer for introduction by frugivorous birds.

Of the 115 Narcondam *Phanerogams*, 33 are trees, 31 are shrubs, 37 are climbing species—woody climbers 16, herbaceous climbers 21; only 5 climbers being armed—and 14 are herbs. Of the 65 Barren Island species, 15 are trees, 17 are shrubs, 16 are climbers—woody 6, herbaceous 10; only 3 armed—and 17 are herbs. There are roughly speaking twice as many trees, shrubs and climbers in Narcondam as in Barren Island; the number of herbaceous species in the latter island is, however, slightly in excess of the number in the former. Of the herbaceous *Phanerogams* seven species are common to both islands; all

are plants that may have been introduced by the sea. Of inland herbaceous species which may have been introduced by fruit-eating or marsh birds, or by the wind, the islands do not have one in common.

In Narcondam there are four *Compositæ* most probably introduced by wind; a grass, *Thsyanolæna*, may conceivably have been introduced in the same way. The two remaining herbs are the *Amorphophallus* which, even if in this island it has developed into a distinct form, *must* have originally been introduced by some fruit-eating bird, and the *Pollia*, which most probably has been introduced by the same agency.

In Barren Island, the wind-introduced species are two orchids and one grass, *Pogonatherum; Ischæmum muticum* has probably been introduced by the sea. The others have been introduced by birds; *Physalis* and *Mitreola* probably by fruit-eating birds; *Oldenlandia*, *Vandellia* and *Oplismenus* by birds to whose feet or feathers seeds have clung. Except *Pogonatherum*, *Ischæmum* and *Mitreola*, the Barren Island herbs are scarce.

The paucity of armed climbers in both islands is striking. The proportion of climbers to erect species is considerably higher in Narcondam, where they form one-third of the whole Phanerogamic flora, than in Barren Island, where they form only one-fourth, and partly in consequence of this, the jungle in Barren Island is opener than in Narcondam. Of the thirty-seven climbers in Narcondam, twelve have undoubtedly been introduced by fruit-eating birds, while one has most probably been introduced by its fruits having stuck to the feathers of some bird; fourteen have been introduced by the sea; six by winds. Of the remaining four species, which are more doubtful, two may be safely assumed to be here sea-introduced species also; one may be put down to the agency of birds, and only one species, the *Dioscorea*, is quite doubtful; perhaps the sea is on the whole the most likely agency.

Similarly, of the sixteen climbers on Barren Island, five are clearly species introduced by fruit-eating birds; to these a sixth probably should be added. Four are species certainly sea-introduced; to these another should probably, and two more should perhaps be added; of wind-introduced species there are three.

Very few of these species are common to both islands, only nine, or about half the Barren Island and one-fourth of the Narcondam climbers being so; of these four are again sea-shore species, and the *Dioscorea* found in both islands may be a fifth of the sea-introduced class. Two, the *Hoyas*, are wind-introductions; one, *Capparis sepiaria*, is certainly; another, the *Abrus*, is probably, a bird-introduced species.

Of the thirty-one Narcondam shrubs, one (*Musa*) has been introduced by man; on the other hand not a single shrub owes its presence

to the agency of wind. As many as seventeen are unequivocally bird-introduced species; and ten are unequivocally sea-introduced species; the remaining three, which are all capsular-fruited *Euphorbiaceæ* (*Actephila*, *Macaranga* and *Mallotus*), though not unequivocally sea-introduced, are in all probability species of this class.

Of the seventeen Barren Island shrubs, seven are undoubtedly bird-introduced species; nine are sea-introduced species; one species, *Dodonæa*, is, though somewhat equivocally, to be looked upon as wind-introduced.

There is much greater conformity between the floras as regards this class; thirteen of the Barren Island shrubs occur also in Narcondam, only four being peculiar; all but one of the sea-shore, and all but two of the bird-introduced shrubs in Barren Island occur in Narcondam also.

The trees in the two islands have last to be considered. Of the thirty-three in Narcondam twenty-one, or more than three-fifths, have been introduced by birds; two from their fruits having been attached to the feet or feathers, the others, by fruit-eating birds: ten may have been sea-introduced; for seven this mode of introduction is undoubted, as regards *Caryota* it is rather equivocal, and the Coco-nut may have been deliberately introduced; two species are wind-introduced.

Of the fifteen Barren Island trees, nine are bird-introduced species; five are sea-introduced; one has been introduced by wind.

Here again great conformity between the floras is observable; of the fifteen Barren Island trees, ten occur in Narcondam: these include all the bird-introduced ones except four, and all but one of the sea-introduced species; one wind-introduced species is common to the two islands.

Among herbaceous species, where the equality of numbers promised most agreement, there is therefore greater diversity between the two floras than among the others.

Of the 75 species of *Phanerogams* peculiar to Narcondam, 22 have been introduced by the sea, 42 by birds, and 10 by winds; one species (*Musa*) has been introduced by man. Of the 25 species peculiar to Barren Island, on the other hand 5 have been introduced by the sea, 15 by birds, 5 by winds. Of the 40 Phanerogams common to the two islands; 24 are sea-introduced, 13 are bird-introduced, 3 wind-introduced. In the common element of the two floras, the sea-introduced species form the dominant class, being nearly double the bird-introduced species and six times as numerous as the wind-introduced ones. In the special elements, on the other hand, the bird-introduced species form in both instances the dominant class; in Narcondam they are nearly twice as numerous as the sea-introduced and four times as numerous as the wind-introduced species; in Barren Island, they are three times as numerous as either of these kinds.

Materials for a Flora of the Malayan Peninsula.—*By* George King, M. B., LL. D., F.R.S, C.I.E., *Superintendent of the Royal Botanic Garden, Calcutta.*

[Read June 7th].

No. 5.

Order XVI. DIPTEROCARPEÆ.

Resinous trees, rarely climbing shrubs. *Leaves* alternate, simple, quite entire, rarely sinuate-crenate, penni-nerved, the main nerves bold; stipules usually small and inconspicuous, sometimes larger and persistent, or fugitive, leaving an annular scar, (absent in *Ancistrocladus*). *Flowers* in few- or many-flowered, axillary and terminal racemes or panicles. *Bracts* usually minute or 0, rarely larger and persistent. *Sepals* free, or cohering into a tube surrounding but free from, or more or less adnate to, the base of the ovary and fruit. *Petals* contorted, connate at the base, or free. *Stamens* ∞, 15, 10 or 5, hypogynous or sub-perigynous, free, connate, or adnate to the petals; filaments short, often dilated at the base; anthers 2-celled, the outer valves sometimes larger, connective often aristate or with an obtuse appendage. *Ovary* slightly immersed in the torus, usually 3- rarely 2- or 1-celled; style subulate or fleshy, entire or with 3 minute stigmatic lobes; ovules anatropous, 2 in each cell, pendulous or laterally affixed (solitary and erect in *Ancistrocladus*). *Fruit* usually nut-like, its pericarp leathery or woody, 1- rarely 2-seeded, surrounded by the variously accrescent calyx of which two or more sepals or lobes are usually developed into linear wings. *Seed* exalbuminous (albumen fleshy and ruminate in *Ancistrocladus*); cotyledons fleshy, equal or unequal, straight or more or less plaited and crumpled, sometimes lobed; radicle directed towards the hilum, usually included between the cotyledons.—Distrib. Confined (except a few Tropical African species) to Tropical Eastern Asia; genera about 18, species about 250.

Sect. I. Eu-Dipterocarpeæ. *Ovaries* 3-celled, each cell 2-ovuled: stigmas united, more or less 3-lobed: seeds usually exalbuminous the outer segments of the fruiting calyx usually enlarged: trees or erect shrubs, mostly stipulate.

Fruiting calyx with 2 or more of its segments or sepals produced into long membranous, reticulate, nerved wings much longer than the fruit; pericarp leathery, (woody in some sp. of *Shorea*).

Fruiting calyx with a distinct tube.
Calyx-tube quite free from the fruit ... ... 1 *Dipterocarpus.*
Calyx-tube adherent to the fruit 2 *Anisoptera.*
Sepals united at the base only, the short calyx-tube either quite free from the fruit or slightly adherent to it, the calyx-segments or sepals valvate or nearly so.
Stamens with a single, long apical, appendage from the connective 3 *Vatica.*
Stamens with 4 apical appendages from the anthers and 1 from the connective ... 4 *Pentacme.*
Sepals free, imbricate.
The three outer sepals always, and one or both of the inner two occasionally, winged in the fruit; anthers with a short apical appendage from the connective ... ... 5 *Shorea.*
The two outer sepals winged in the fruit, the three inner not longer than the fruit and closely embracing it; stamens with a terminal appendage from the connective longer than the anther ... ... 6 *Hopea.*
Sepals of fruiting-calyx all enlarged but not exceeding, or only slightly exceeding, the fruit; pericarp leathery or woody.
Fruiting calyx embracing the fruit but not adherent to it.
Sepals of fruiting calyx slightly thickened.
Sepals of fruiting-calyx oblong, nearly equal, usually shorter than the fruit, reflexed or erect ... 7 *Retinodendron.*
Sepals of fruiting-calyx rotund, unequal (the inner two smaller), reflexed ... 8 *Isoptera.*

Sepals of fruiting calyx much thickened and woody at the base.
Calyx forming a cup at the base of the fruit, but not adhering to it: pericarp woody ... ... 9 *Balanocarpus.*
Calyx adherent to the fruit: pericarp thickly leathery ... ... 10 *Pachynocarpus.*

Sect. II. Ancistrocladeæ. *Ovary* 1-celled with a single ovule; stigmas 3, distinct: *Seeds* with copious ruminate albumen. Exstipulate climbers. ... ... 11 *Ancistrocladus.*

1. Dipterocarpus, Gærtn. f.

Lofty trees, stellately pubescent or more or less clothed with fascicled hairs. *Leaves* coriaceous, entire or sinuate-crenate; lateral nerves connected by marginal loops and transverse reticulations; stipules large, valvate, enclosing the terminal bud, finally caducous and leaving an annular scar. *Flowers* large, white or reddish. *Calyx-tube* free. *Petals* usually pubescent externally, especially on the outer margin. *Stamens* ∞; anthers linear, equivalved, acuminate. *Ovary* 3-celled; style filiform; ovules 2 in each cell. *Fruit* nut-like, 1-seeded, enclosed in the accrescent calyx-tube, free; accrescent calyx-lobes 2, erect. *Seed* adnate to the base of the pericarp; cotyledons large, thick, unequal; radicle inconspicuous.—Distrib. Tropical E. Asia; species about 60.

Ripe fruit sphæroidal or ellipsoidal, neither angled nor winged.
Young branches, petioles, under surfaces of the midribs, and nerves of the leaves covered with coarse stiff fasciculate hairs.
Fruit glabrous ... ... 1. *D. crinitus.*
„ stellate-pubescent ... ... 2. *D. Scortechinii.*
Young branches deciduously pubescent.
Leaves with 12 or more pairs of nerves.
Leaves oblong-elliptic, their under surfaces sparsely stellate-pubescent ... 3. *D. Skinneri.*
Leaves elliptic or ovate-elliptic, their under surfaces puberulous or quite glabrous ... ... 4 *D. turbinatus.*
Leaves with 8 to 10 pairs of nerves.
All parts quite glabrous ... ... 5. *D. Kerrii.*

Ripe fruit with 5 angular tuberosities on its upper portion ... ... 6. *D. cornutus.*
Ripe fruit 5-angled:
Calyx-tube glabrous; leaves 2·5 to 3·25 in. long ... ... 7. *D. fagineus.*
Calyx-tube densely stellate-tomentose; leaves 6 to 8 in. long ... ... 8. *D. oblongifolius.*
Ripe fruit with its 5 angles produced into wings:
Leaves glabrous:
Young branches at first scurfy-puberulous, ultimately quite glabrous: buds ovoid, minutely pale canescent ... 9. *D. grandiflorus.*
Young branches as in the last, but with conspicuous tawny-tomentose, oblique annuli; buds cylindric, hoary-canescent ... ... 10. *D. Kunstleri.*
Young branches minutely tawny-pubescent, not annulated and never glabrous; buds ovoid, densely sericeous 11. *D. Griffithii.*
Leaves minutely stellate-pubescent on the lower surface:
Flowers about 1 in. long; leaves with rounded or sub-cordate bases; young branches very stout, with ovoid buds: the accrescent lobes of the calyx 1·5 in. broad ... ... 12. *D. incanus.*
Flowers 1·5 in. long; leaves with rounded or cuneate, not sub-cordate, bases: young branches moderately stout with cylindric buds: accrescent calyx-lobes ·7 to ·8 in. broad ... ... 13. *D. alatus.*

1. Dipterocarpus crinitus, Dyer in Hook. fil. Fl. Br. Ind. I. 296. A tree 90 to 150 feet high: young branches, petioles, under surface of midrib and nerves, pedicels and outer surface of bracts of inflorescence clothed with stiff yellowish-brown fascicled hairs. *Leaves* very coriaceous, ovate or more usually obovate, acute, the base rounded or subacute; the edge entire, fringed with fascicled hairs, recurved (at least when dry); both surfaces sparsely hispid when young, glabrescent when old; main nerves 12 to 18 pairs, spreading, rather straight, very prominent on the lower, depressed on the upper, surface; length 3 to 5 in., breadth 1·75 to 2·75 in., petiole 1 to 1·25 in. *Racemes* about 6-flowered. *Flowers* nearly 2 in. long. *Calyx* glaucous, glabrous. *Petals*

puberulous, linear, blunt. *Stamens* 15. *Fruit* (immature) ellipsoid, wingless, glaucous, smooth; the enlarged calyx-lobes linear-oblong, blunt, 3-nerved, inconspicuously reticulate, shining, 3·5 in. long and ·6 to ·8 in. broad. Dyer in Journ. Bot. 1874, p. 103. *D. hirtus*, Vesque, Comptes-Rendus, 1874, 78, p. 627; Journ. Bot. 1874, p. 151; Dyer l. c. 154.

Malacca; Maingay (Kew Distrib.) No. 196.

Perak; Scortechini, No. 1955. Distrib. Borneo: (fide Dyer), Beccari, 779, 1883.

Burck (Ann. Jard. Bot. Buitenzorg, Vol. 6, p 196) reduces this to *D. Tamparan*, Korth. Korthals however describes the fruit of that species as having accrescent calyx-lobes 13 inches long by 3 broad.

2. Dipterocarpus Scortechinii, King, n. sp. A large tree: young branches rather stout, densely clothed, (as are the short cylindric buds, the petioles and racemes) with large tufts of coarse, brownish, shining hairs. *Leaves* coriaceous, elliptic-ovate, or sometimes elliptic-sub-ovate, sub-entire, abruptly and shortly acuminate, slightly narrowed to the rounded base; upper surface glabrous or glabrescent, the nerves sparsely stellate-pubescent, the midrib tomentose; under surface sparsely stellate-pubescent, the nerves (and especially the midrib) with long silky hairs intermixed: main nerves 16 to 18 pairs, straight, oblique, very prominent beneath: length 6 to 7·5 in., breadth 3 to 3·5 in, petiole 1 to 1·2 in. *Racemes* few-flowered, short. *Fruit* (? immature) ovoid, contracted under the mouth, glaucous, stellate-pubescent, ·75 in. long and ·5 in. in diam; accrescent calyx-lobes linear-oblong, reticulate, slightly narrowed in the lower half, the apex obtuse, obscurely 3-nerved (the middle nerve bold, the two lateral faint), 4 to 5 in. long and ·8 to 1 in. broad.

Perak; Scortechini, No. 1813.

This is closely allied to *D. crinitus*, Dyer, to which Scortechini doubtfully referred it. It differs from *D. crinitus* in its larger leaves and stellate-pubescent fruit. It has also a different time of flowering; for, as Scortechini remarks in his field notes, this is in immature fruit in the beginning of March, while *D. crinitus* does not come into flower until the end of April.

3. Dipterocarpus Skinneri, King, n. sp. A tall tree; young branches thin, deciduously tawny-pubescent. *Buds* cylindric, narrow, golden-sericeous. *Leaves* oblong-elliptic, narrowed in the upper half or third to the acute or shortly acuminate apex, slightly narrowed to the rounded base, upper surface glabrous or sparsely adpressed-pubescent, the midrib tomentose, the lower sparsely stellate-pubescent, the midrib and 16 to 19 pairs of straight oblique nerves adpressed-sericeous; nerves prominent on the lower, faint on the upper, surface when dry:

length 5 to 8 in., breadth 2·25 to 3 in.; petiole ·7 to ·9 in., tomentose. *Racemes* simple, short, 2- or 3-flowered, pubescent. *Flowers* 2·5 in. long. *Calyx* with narrowly campanulate tube, covered outside with minute, pale, stellate tomentum. *Petals* linear-oblong, blunt, more or less pubescent outside. *Fruit* (? immature) globular-ovoid, glabrous, ·65 in. in diam.: accrescent calyx-lobes glabrous, reticulate, linear, blunt, contracted at the very base, nearly 5 in. long and about ·75 in. broad.

Penang; at the back of West Hill, at an elevation of 1,000 feet. Curtis No. 1403.

A very distinct species known only by Mr. Curtis' scanty specimens. I have named it in honour of Mr. Skinner, Resident Councellor of Penang.

4. Dipterocarpus turbinatus, Gaertn. f. Fruct. III. 51, t. 188. A tree 80 to 100 feet high: young shoots rather slender, at first minutely velvety, pale grey, afterwards glabrous: buds cylindric, softly pale pubescent. *Leaves* thinly coriaceous, elliptic or ovate-elliptic, acute or shortly acuminate, the base rounded or sub-cordate, the edges slightly undulate, sometimes sub-crenate; both surfaces glabrous, or the lower puberulous especially on the midrib and nerves: main nerves 12 to 18 pairs, straight, oblique, prominent on the lower surface; length 4·5 to 11 in., breadth 2·5 to 5·25 in.; petiole 1 to 1·5 in., glabrous or pubescent: stipules tawny-velvety in the lower part but pubescent towards the apex. *Racemes* 3- to 5-flowered. *Flowers* 1·25 to 1·5 in. long. *Calyx*-tube obconic, glabrous, smooth, not winged. *Petals* linear-oblong, obtuse, more or less canescent. *Fruit* ellipsoid-ovoid, tapering to each end when young: globular when ripe and ·75 in. in diam., with neither wings nor ridges; the two accrescent calyx-lobes glabrous, conspicuously reticulate, obscurely 3-nerved, oblong-lanceolate, obtuse, 4 to 4·5 in. long and 1·25 in. broad; the three small lobes of the calyx deltoid, very short. Roxb. Hort. Beng. 42; Fl. Ind. II. 612; Corom. Plants III. 10 t. 213. Ham. in Mem. Wern. Soc. VI. 300: Wall Cat. 952; A. DC. Prod. XVI. 2, 607; W. and Arn. Prod. 85; Dyer in Hook. fil. Fl. Br. Ind. I, 295: Journ. Bot. 1874, p. 102 t. 143, fig. 13: Kurz. For. Fl. Burm. I. 114. *D. laevis*, Ham. l. c. 299.; A. DC. l. c. 607. W. and A. Prod. 85: Kurz, l. c. 114. ?*D. indicus*, Bedd. Forest. Rep. 1864-5, 17 cum tab.; Flora Sylvat. t. 94.

Assam, Cachar, Chittagong, Burmah, S. India.

Var. *andamanica*: enlarged calyx-lobes linear-oblong, not oblanceolate, ·75 in. broad; leaves broadly ovate, sub-cuneate at the base.

South Andaman: common.

Following Dyer, I have included under this the plant named *D. laevis* by Buchanan Hamilton in the Memoirs of the Wernerian Society,

Vol. VI. p. 299. Hamilton distinguishes his species *D. laevis* by its flattened branchlets, and perfectly glabrous leaves and petioles, while *D. tuberculatus* Gaertn. has terete branches and pubescent leaves and petioles. The former (called *Dulia Garjan*, by the natives of Chittagong) yields, he says, no wood-oil; while the latter (called *Telia Garjan*) does. The materials before me do not enable me to differentiate the two as species. Moreover, specimens sent to me by Dr. E. Thurston, Reporter on Economic Products to the Government of India, (and which had been collected by the Forest Officer of Chittagong under the vernacular names *Dulia* and *Telia Garjan*) appear exactly alike. Careful investigation in the field may however prove that there is some better basis for Hamilton's view than the trifling differences which he has noted in the outline of the branchlets and the pubescence of the leaves. I am not at all satisfied that the Southern Indian tree named *D. indicus* by Beddome is rightly reduced here. Better Herbarium specimens than any which I have seen, and investigation in the field, are I think required to settle this point also.

5. Dipterocarpus Kerrii, King, n. sp. A tall tree; all parts, except the petals, glabrous; young branches thin, slightly flattened at the tips, not annular. *Buds* narrow, cylindric. *Leaves* coriaceous, ovate-elliptic, acute or very shortly and bluntly acuminate, the edges undulate, the base cuneate; main nerves 8 to 11 pairs, oblique, straight, bold and shining on the lower surface; length 3 to 4 in., breadth 2 to 2·5 in., petiole ·9 to 1·1 in. *Panicles* short, spreading, few-flowered. *Flowers* 1·5 in. long. *Calyx-tube* glaucous. *Petals* linear-oblong, obtuse, more or less pubescent or tomentose towards their middle externally. *Fruit* turbinate, smooth, 1 to 1·15 in. in diam.; accrescent calyx-lobes linear-oblong, blunt, reticulate, 3-nerved, 4·5 to 5 in. long, and 1·25 to 1·5 in. broad: minor lobes very short, broad, rounded.

Malacca; Maingay (Kew Distrib.) No. 199, Griffith 727, Derry 1032. Pangkore; on Gunong Yunggal, Curtis No. 1561.

Mr. Curtis describes this as a very large tree yielding an oil. It resembles *D. Hasseltii*, Bl., but has much smaller leaves.

I have named this species in honour of Dr. Kerr, an enthusiastic Botanist much interested in the Malayan Flora. Closely allied to this, and perhaps identical with it, is the tree represented by Mr. Curtis' specimen (Waterfall, Penang) No. 1653. The young wood of the latter is however paler than that of *D. Kerrii* from Pangkore and Malacca, and the leaves are puberulous, not glabrous, beneath. I have seen no flowers of it.

6. Dipterocarpus cornutus, Dyer in Hook. fil. Fl. Br. Ind. I, 296. A tree 50 to 70 feet high: young branches stout, compressed, minutely

rufous-tomentose with a few scattered longer hairs. *Leaves* large, coriaceous, oblong, blunt at each end, the edges undulate or obscurely sinuate-crenate: upper surface glabrous, the midrib and nerves pale when dry: under surface densely covered with minute, pale, stellate tomentum: main nerves 16 to 20 pairs, prominent, spreading, straight, the transverse veins rather distinct: length 9 to 14 in., breadth 5 to 8 in., petiole 2 to 3 in.; stipules rufous-sericeous, the hairs fascicled. *Racemes* 7- or 8-flowered. *Flowers* 1·75 in long. *Calyx-tube* 5-winged, canescent, the short lobes very obtuse. *Petals* oblong or sub-spathulate, stellate-canescent. *Fruit* about 1 in. long, sub-globular, with 5 thick short wings in its upper half; enlarged calyx-lobes linear, obtuse, 5 or 6 in. long and 1·25 to 1·75 in. broad, shining, boldly 3-nerved, reticulate. Dyer in Journ. Bot. 1874, p. 103, t. 143. fig. 15. *Parinarium dillenifolium*, R. Br. Wall. Cat. No. 7520. *Petrocarya dillenifolia*, Steud. Nomencl. II, 309.

Singapore: Wallich. Malacca: Maingay (Kew Distrib.) No. 197. Penang: Curtis No. 1402. Perak: Wray, No. 4160.

It was Sir Joseph Hooker who first pointed out that the Wallichian plant No. 7520, issued as *Parinarium*, belongs really to this species.

7. Dipterocarpus fagineus, Vesque in Comptes-Rendus, tome 78, p. 626: Journ. Bot. for 1874, p. 149. A tree 40 to 80 feet high: young branches slender, at first minutely pulverulent tawny-pubescent, ultimately glabresent or glabrous and dark-coloured, the buds cylindric. *Leaves* coriaceous, elliptic-ovate to elliptic-lanceolate, acute, the edges entire or sub-undulate-crenulate, the base cuneate, both surfaces puberulous especially on the midrib and nerves; main nerves 10 to 13 pairs, straight, oblique, prominent on the sub-glaucous lower surface; length 2·5 to 3·25 in., breadth 1·3 to 1·75. *Racemes* slender, 1- to 4-flowered. *Flowers* about 1·25 in. long. *Calyx-tube* campanulate, not constricted at the mouth, 5-angled. *Ripe fruit* ellipsoid, tapering more at the base than at the apex, 5-angled, glaucous, 1 in. long: accrescent calyx-lobes linear-oblong, obtuse, contracted at the base, 3-nerved, 2·5 to 3 in. long and about ·75 in. broad. *D. prismaticus*, Dyer Journ. Bot. 1874. pp. 104, 152. t. 144 fig. 17. *Dipterocarpus*, sp. Hook. fil. in Linn. Trans. XXIII, 161.

Perak: King's Collector No. 3527, Scortechini. Penang; Curtis No. 1401.

D. fagineus, Vesque, has been collected hitherto only in Borneo (Beccari No. 3008 and Motley No. 143,) and the leaves are described by Dyer as being papyraceous in texture and having about 8 pairs of lateral nerves. The leaves of the Perak tree which I now refer to this

species, are coriaceous and have 10 to 13 pairs of nerves. The Perak plant may therefore belong to a distinct, but closely allied, species. Curtis' Penang specimens (No. 1401) are quite glabrous in all parts except the petals.

8. Dipterocarpus oblongifolius, Blume, Mus. Bot. Lugd. Bat. II, 36. A tall tree: young branches glabrous, dark-coloured, sparsely lenticellate; buds cylindric. *Leaves* coriaceous, oblong or elliptic-oblong, shortly and bluntly acuminate, the edges sub-undulate, the base cuneate; both surfaces shining, glabrous, the midrib and 13 to 16 pairs of straight bold nerves with a few stellate hairs along their sides: length 6 to 8 in., breadth 2 to 2·75 in., petiole ·9 to 1·1 in. *Racemes* slightly supra-axillary, densely tawny-tomentose, bifurcating, each branch with 3 to 5 flowers and several linear membranous deciduous bracts. *Flowers* about 2·5 in. long. *Calyx-tube* fusiform, slightly contracted at the mouth, 1 in. long, boldly 5-angled, densely stellate tawny-tomentose as are the 3 minor calyx lobes; the 2 larger linear-oblanceolate lobes sparsely stellate-pubescent, boldly 1-nerved and with 2 obscure lateral nerves. *Ripe fruit* unknown. Miq., Fl. Ind. Bat. I, pt. 2, p. 498; A.DC. Prod. XXI. 2, 614; Dyer in Journ. Bot. 1874, 105. *D. stenopterus*, Vesque, Comptes-Rendus, tome 78, p. 625; Journ. Bot. 1874, p. 150.

Perak, Scortechini. Distrib. Borneo, Sumatra.

Except as regards inflorescence, the Perak specimens of this are practically glabrous. In Bornean specimens, however, the young parts, buds and petioles are fusco-tomentose. (Dyer l. c.)

9. Dipterocarpus grandiflorus, Blanco, Fl. Filipp. Ed. 2, 314. A tree 80 to 120 feet high: young branches rather stout, sub-compressed, at first hoary-puberulous, but finally quite glabrous, nearly black when dry; leaf-buds shortly ovoid, minutely pale-canescent. *Leaves* coriaceous, ovate-elliptic, shortly acuminate; the base broad, rounded or sub-truncate, sub-cordate; the edges entire or obscurely undulate-crenate, both surfaces glabrous; main nerves 14 to 16 pairs, spreading, rather straight, prominent on the lower, obsolete on the upper, surface; length 6 to 9 in., breadth 3·5 to 5 in.; petiole 2 to 3 in. long, glabrous. *Racemes* about 4-flowered. *Flowers* articulated to the rachis, 2 in. long. *Calyx-tube* 5-winged from base to apex. *Petals* linear-oblong. *Fruit* oblong, 2·5 in. long, wings stout, ·5 in. or more in width; the 2 accrescent lobes of the calyx oblong, obtuse, glabrous, reticulate, 3-nerved, the mesial nerve the longest and most distinct, 7 to 9 in. long and 1·5 to 2 in. broad, the smaller calyx lobes sub-orbicular. A.DC. Prod. XVI., 2 p. 612; Dyer in Journ. Bot. 1874, p. 106, t. 145, fig 19; Burck in Ann. du Jard. Bot. Buitenzorg, vol 6, 201. *D. Blancoi*, Bl., Mus. Lugd. Bat. II.

35. *D. Motleyanus*, Hook. fil. in Trans. Linn. Soc. XXIII. 159. A.DC. in DC. Prod. XVI., pt. 2, 611. *D. pterygocalyx*, Scheff. Obs. Phyt. II. 35; Dyer in Hook. fil. Fl. Br. Ind. I, 298. *Mocanera grandiflora*, Blanco, Fl. Filipp. Ed. I, 451. *Anisoptera?* Turcz. in Bull. Soc. Nat. Mosc. 1858, I, 233.

Malacca: Maingay (Kew Distrib.) No. 198. Penang: Curtis 424. Perak: Scortechini 152 b. Distrib. Bangka, Teysmann. (?) Philippines.

The late Father Scortechini's field notes contain the following account of the flower: "The petals of this are red inside in the middle, but pale towards the margins; the stamens are numerous, 2-seriate, united in a ring by their enlarged bases, falling off together: staminodes many, short, adpressed to the ovary. Ovary pubescent, scaly towards the base. Fruiting-calyx reddish." The species comes near *D. Griffithii*: but is distinguished from it by the characters which I have noted under that species. Flowers of *D. Griffithii* are, however, wanting for comparison.

10. Dipterocarpus kunstleri, King, n. sp. A tree 80 to 120 feet high; young branches flattened, at first sparsely covered with minute scurfy deciduous pubescence, ultimately glabrous, but always with oblique tawny-tomentose annuli. *Buds* narrowly cylindric, hoary-canescent. *Leaves* elliptic or sub-rotund-elliptic, very shortly acuminate, the base rounded or sub-cuneate, the edges undulate or sub-crenate, both surfaces glabrous: main nerves 16 to 18 pairs, oblique, straight, prominent on the lower surface: length 7·5 to 11 in., breadth 4·5 to 7 in., petiole 1·5 to 2 in. *Racemes* 6 to 8 in. long, often bifid, 4- to 6-flowered, glabrous. *Flowers* 2·5 to 3 in. long, glaucous. *Calyx-tube* narrowly obconic, 5-winged, glaucous. *Petals* linear, obtuse, glaucous. *Fruit* sub-globular, an inch or more long, with 5 wings about ·25 in. wide: accrescent calyx-lobes oblong, obtuse, slightly narrowed towards the base, glabrous, reticulate, 3-nerved, 6 or 7 in. long and about 1·25 in. broad.

Perak: King's Collector, Nos. 3638, 3798, 7508 and 7606.

Allied to *D. grandiflorus;* but with larger leaves, smaller fruit and different buds. Allied also to *D. Griffithii* but with smaller fruit and different buds. This species has leaves like *D. trinervis* Bl. and *D. retusus* Bl., but differs from these in having winged fruit: it also resembles *D. Dyeri*, Pierre, which, however, has longer leaves with hairy petioles and more narrowly winged fruit.

11. Dipterocarpus Griffithii, Miq. Ann. Mus. Lugd. Bat. I, 213. A tree 100 to 125 feet high: young branches stout, sub-compressed, minutely tawny-canescent; the leaf buds ovoid, densely covered with

yellowish-brown shining hair. *Leaves* coriaceous, broadly ovate, usually slightly narrowed to the rounded base, but sometimes the base truncately sub-cordate, the apex acute or shortly acuminate, both surfaces glabrous, the upper shining; main nerves 12 to 14 pairs, spreading, straight, slightly prominent on the lower surface: length 5 to 11 in., breadth 3 to 5·5 in., petiole 2·25 to 3·5 in. *Racemes* 3- or 4-flowered. *Flowers* 1·5 in. long. *Calyx* ob-conic, sub-glabrous, 5-winged. *Fruit* oblong, 2·5 in. long, the wings extending from base to apex, stout, ·5 in. or more broad: accrescent lobes of calyx oblong, obtuse, glabrous, reticulate, boldly 3-nerved, 5 to 7 in. long and about 1·75 in. broad. A. DC. in DC. Prod. XVI, Pt. 2, 611; Dyer in Hook. fil. Fl. Br. Ind. I, 299: Journ. Bot. 1874, 107. Kurz For. Flora Burm. I, 116. *D. grandiflorus* Griff. Notul. IV, 515 (not of Blanco).

S. Andaman: Kurz, King's Collector.

This closely resembles *D. grandiflorus*, Blanco, but the two may be readily distinguished by their young branches and leaf-buds. The young branches of this species are pale canescent and its leaf-buds broad and golden sericeous; while the branchlets of *D. grandiflorus* are quite glabrous and dark-coloured and the buds are narrow and pale canescent.

12. Dipterocarpus incanus, Roxb. Hort. Beng. 42; Fl. Ind. II. 614. A tall tree: young shoots terete, stout, densely but minutely tawny-tomentose; the buds short, ovoid, thick, with longer tomentum than the branchlets. *Leaves* coriaceous, broadly ovate, acute or subacute, the base rounded or sub-cordate, the edges undulate; upper surface glabrous, the midrib alone slightly pubescent: under surface uniformly pale, shortly but softly stellate-pubescent, the midrib and nerves tomentose. main nerves 12 to 15 pairs, oblique, straight, prominent on the lower surface; length 5 to 8 in., breadth 2·5 to 4·75 in.; petiole ·8 to 1·25 in., pubescent. *Flowers* about 1 in. long, usually in racemes but occasionally in short 7- or 8-flowered panicles. *Calyx-tube* ob-conic, 5-winged, minutely tomentose. *Petals* oblong, obtuse. *Fruit* sub-globose, about 1 in. in diam., 5-winged from base to apex; the wings thin, from ·25 to ·5 in. broad; the 2 accrescent lobes of the calyx narrowly oblong, obtuse, glabrous, much reticulate, 3-nerved in the lower half, when mature 5·5 in. long and nearly 1·5 in. broad; the 3 minor lobes sub-orbicular. Wight & Arn. Prod. 84; A. DC. Prod. XVI. 2, 611; Dyer in Hook. fil. Fl. Br. Ind. I, 298; Journ. Bot. 1874, p. 106.

S. Andaman: common. Distrib. Burmah, Kurz, Herb. No. 2109 (in part).

The plant here described under the name *D. incanus* closely re-

sembles *D. alatus*, Roxb.; but its flowers are shorter, the leaves are more broadly ovate, and have rounded or cordate, not cuneate, bases, while the pubescence of the lower surface is paler and more uniform and the young branchlets and leaf-buds are stouter. Moreover the accrescent lobes of the calyx are longer and nearly twice as broad: the 5 wings of the calyx-tube are also broader. Roxburgh's description of his species *D. incanus* is very brief; he left no drawing of it at Calcutta; and no authentic specimens of his own naming appear to exist. It is therefore impossible to decide with absolute certainty what Roxburgh's *D. incanus* is. At Kew Mr. Dyer accepts Kurz's Pegu specimen No. 2109 as belonging to it, and the specimens recently brought from the S. Andaman by my collectors agree with that number of Kurz's.

13. Dipterocarpus alatus, Roxb. Hort. Beng. 42; Fl. Ind. II 614. A tree 80 to 125 feet high: young branches terete, rather stout, softly and minutely pubescent; the buds narrow, rufous-sericeous. *Leaves* coriaceous, ovate-elliptic, the apex acute, the base cuneate, the edges undulate: upper surface glabrous except the minutely tomentose nerves and midrib: lower sparsely and minutely stellate-pubescent, the 10 to 14 pairs of oblique rather straight prominent main nerves densely tomentose; length 5 to 8 in., breadth 2·75 to 4·5 in.; petiole 1 to 1·5 in., pubescent: stipules sericeous-pubescent. *Panicles* 6- or 7-flowered. *Flowers* about 1·5 in. long. *Calyx-tube* ob-conic, 5-winged, stellate-pubescent, as are the linear-oblong petals. *Fruit* globose, 1 in. in diam., puberulous, 5-winged from base to apex; the wings glabrous, thin and about ·5 in broad; the 2 accrescent lobes of the calyx linear-oblong, obtuse, glabrous, much reticulate, 3-nerved in the lower half, 4·5 in. long and ·7 or ·8 in. broad: the 3 unenlarged lobes obtuse. Wall. Cat. 953: A. DC. Prod. XVI. 2, 611 *in part:* Dyer in Hook. fil. Fl. Br. Ind. I, 298; Journ. Bot, 1874, p. 106 (excl. syn. *D. costatus*, Gaertn.) Kurz For. Flora Burm. I. 116; Pierre Flore Forest. Coch-Chine, t. 212. *Oleoxylon balsamiferum* Wall. Cat. p. 157.

Burmah: Wallich, Brandis, Helfer No. 730, Kurz. Andamans?

Gærtner's figure and description of his *D. costatus* are confined to the fruit only. The former is that of a *Dipterocarpus* with the elongated calyx-lobes of *D. alatus*, Roxb., but with the 5 wings on the tube of the calyx very narrow, whereas those of Roxburgh's *D. alatus* are very broad. Dyer (F. B. I. i, 298) expresses his belief that Gaertner's figure is a bad representation of *D. alatus*, Roxb., and he reduces Gaertner's *D. costatus* to Roxburgh's *D. alatus*. M. De Candolle, on the other hand, retains *D. costatus*, Gaertn. as a good species and in this he is followed by Kurz; but Messrs. Dyer and De Candolle agree

that the *D. costatus* described by Roxburgh is a different plant from Gaertner's. For Mr. Dyer it is still a doubtful species; while M. De Candolle reduces it to *D. angustifolius* W. & A., which for Dyer is in its turn a doubtful species. A careful examination of the material now collected at Calcutta and at Kew leads me to believe that *D. costatus*, Gaertn., is a perfectly good species, and that the best character to distinguish it from Roxburgh's *D. alatus* is the narrowness of the wings of the calyx-tube. Specimens collected in Burmah by Kurz (No. 113 of his Herbm.) and by Brandis, have fruits exactly like that figured by Gaertner. Moreover I see no reason for thinking that the tree described by Roxburgh (Fl. Ind. II; 614) as *D. costatus*, Gaertn., is anything else than Gaertner's plant. Mr. Dyer (Journ. Bot. 1874, p. 153) expresses the opinion that *D. Lemeslei*, Vesque—a species collected on the island of Pulo Condor off the Cambodian coast—is reducible to *D. alatus*, Roxb.

It is very doubtful whether *D. alatus*, Roxb., occurs in the Andamans. I have seen no specimens of it from these islands, and I give it as an Andaman plant on the authority of the "Flora of British India."

Besides the preceding, there are various other species of *Dipterocarpus* in the Calcutta Herbarium from localities within the British Malayan region which, for want of sufficient materials, I am unable to describe. Chief amongst these are :—

(1) Curtis No. 1560 from Penang, a species with winged calyx-tube.

(2) A species from Perak, represented in Scortechini's collection (without number) by fruits resembling those of *D. Lowii* H., f., *D. intricatus*, Dyer, and *D. lamellatus*, Hook. fil.

(3) A species from the Andamans with leaves resembling those of *D. Griffithii*, Miq., but with globular fruit which has neither angles nor wings on the calyx-tube. This possibly may be a form of *D. pilosus*, Roxb.

(4) A Perak species (Herb. Scortechini mixed with No. 1478) represented by fruits something like those of *D. fagineus*, Vesque, but with the calyx-tube winged, not angled.

(5) A Perak species represented by leaf-twigs and loose fruit of a species resembling both *D. fagineus*, Vesque, and *D. gracilis*, Bl., but differing from both.

(6) A species from Perak (Wray No. 4031) having leaves like *D. Griffithii*, Miq., but with shorter petioles, and having also fruit rather like *D. Griffithii*, but the calyx-tube with narrower wings, and the minor calyx-lobes smaller.

2. Anisoptera, Korth.

Resinous trees. *Leaves* coriaceous, entire, feather-veined and finely reticulate; stipules small, fugacious or inconspicuous. *Flowers* in lax terminal panicles *Calyx-tube* very short, adnate to the base of the ovary; the segments imbricate, then subvalvate. *Stamens* ∞; anthers ovoid with a long subulate connective, outer valves larger. *Ovary* 3- (rarely 4- 5-) celled; style fleshy, ovoid or oblong, with an attenuate 3–5-fid apex; ovules 2 in each cell. *Fruit* adnate to the calyx-tube, indehiscent, 1-seeded, crowned by the accrescent calyx-segments, of which 2 form linear-oblong lobes. *Cotyledons* fleshy, unequal; radicle superior. —Distrib. Malay Peninsula and Archipelago to New Guinea. Species about 6.

1. Anisoptera Curtisii, Dyer MSS. A tree 80 to 120 feet high: young branches slender, minutely scurfy-tomentose. *Leaves* oblong, tapering to both ends, the apex sub-acute or acute, the base narrowed but rounded; the upper surface glabrous, shining, the lower densely ochraceous-lepidote and sparsely stellate-pubescent; main nerves 18 to 20 pairs, spreading: length 2 to 3·5 in., breadth ·75 to 1 25 in., petiole ·5 to ·75 in. Accrescent calyx-lobes 3·5 to 4·5 in. long, linear-spathulate, shining, 3-nerved: the transverse veins bold and numerous.

Penang: Curtis. Perak: King's Collectors.

Var. latifolia: leaves broadly elliptic, blunt, the bases rounded but narrowed.

Penang: Curtis, No. 1400.

The vernacular name of this in Penang is *Ringkong.*

3. Vatica, Linn.

Large or moderately sized resinous trees. *Leaves* coriaceous, entire, feather-veined and finely reticulate; stipules small, fugacious or inconspicuous. *Flowers* in axillary and terminal panicles, usually tomentose before expansion. *Calyx-tube* short, free, or adnate to the base of the ovary; segments somewhat acute, imbricate, then sub-valvate. *Stamens* 15; anthers oblong, external valves larger, connective apiculate. *Ovary* 3-celled; style short, subulate, or apex clavate or capitate; stigma entire or 3-toothed; ovules 2 in each cell. *Fruit* leathery, indehiscent, 1-seeded, surrounded by and sometimes partly adnate to the accrescent, membranous, nerved and reticulate calyx-lobes, two of which expand into narrow wings 2 or 3 in. long, the other three being much smaller. *Cotyledons* fleshy.

Distrib. Tropical Asia and chiefly Malaya; species about 10.

Synaptea is a genus established by Griffith (Notulæ IV., 516, Tab. 585 A, fig V.) for a tree collected at Mergui, and named by him *Synap-*

tea odorata. This plant has been named *Synaptea grandiflora* by Kurz, (Journ. A.S., Beng., 1870, 2, 65), and *Anisoptera odorata* Kurz, (For. Flor. Burm. I, 112), while Dyer has identified it with *Hopea grandiflora*, Wall, Cat. 958, and reduced it to *Vatica grandiflora* (F.B.I., i., 301).

The characters of the genus *Synaptea*, as given by its author, are practically those of *Vatica*, Linnæus (Mantissa II., p. 152-3, No. 1311), except that, whereas in the Linnæan description nothing is said about the fruit or its relation to the calyx, Griffith distinctly explains that he has given the name *Synaptea* because the ovary is adnate to the calyx. He does not say to what extent adnate, but, in fruiting specimens of his *Synaptea odorata*, the adhesion extends to the lower part only. In the "Mantissa" of Linnæus, only one species of *Vatica* is described, *viz.*, *V. chinensis;* and of the specimen thus named in the Linnæan Herbarium, Sir J. G. Smith publishes a figure (Smith Ic., ined., t. 36.). This figure however does not show clearly whether the base of the ovary is, or is not, adherent to the calyx, and the fruit is not figured at all. A reference to Linnæus' specimen ought to settle what *V. chinensis* really is; but unfortunately it has not settled it. I have not myself examined the actual Linnæan specimen; but the opinions of botanists who have examined it vary as to its identity. The plant is generally admitted not to be of Chinese origin, for no Dipterocarp is known to inhabit China. Wight and Arnot are of opinion (Prod. 84) that *Vatica chinensis* is the same as *Vatica laccifera*, W. A. (*Shorea Talura*, Roxb.—*fide* Dyer). Alph. De Candolle (Prod. XVI., 2, p. 619) keeps up the species *V. chinensis*, while Dyer (Fl. Br. Ind., I, 302) reduces it to *Vatica Roxburghiana*, Blume (Mus. Bot. Lugd. Bat. II, 31. t. 7.), Blume's *Vatica Roxburghiana*, being, as the citations and figure given by that author show, the *Vateria Roxburghiana* of Wight's Illustrations, p. 87, and Icones t. 26. It cannot be demonstrated, therefore, either from Linnæus' description or specimen, or from Smith's figure of the latter, whether Linnæus intended his genus *Vatica* to include only plants with the ovary and fruit free from the calyx, or whether plants in which there is such partial adhesion might not also be admitted. If the latter were the case there would be no occasion to keep up the genus *Synaptea.* This is the view adopted by Messrs. Hooker and Bentham, who remark of *Synaptea*, "*ex descriptione auctoris verisimiliter ad Vaticam referenda est.*" This view is also adopted by Dyer, in "Hooker's Flora of British India," where he reduces *Synaptea odorata*, Griff., to the genus *Vatica*, Section *Eu-Vatica.* This view is also to a certain extent adopted by Burck who (Ann. Jard. Bot. Buitenzorg) makes *Synaptea* a section of *Vatica*, characterised by having the lobes of the fruiting

calyx unequally accrescent, two of them being much elongate, and *the fruit being partly inferior*; while the section *Eu-Vatica*, as proposed by Bentham and Hooker originally, and adopted by Burck, is characterised by having the same fruiting calyx as *Synaptea* ; nothing being said about the adhesion between the calyx and the fruit. Pierre, on the other hand, keeps up *Synaptea* as a genus on account of the presence of albumen and the structure of the embryo (characters not easily worked in herbarium specimens of this family). In my own opinion it appears advisable to admit *Synaptea* as a section of *Vatica*, but to exclude *Isauxis*, *Retinodendron*, and *Pachynocarpus*, retaining these as distinct genera. *Vatica* would, according to this scheme, be divided into two sections :—

I. *Eu-Vatica* :—Fruit free from the accrescent calyx, *i.e.*, fruit superior.

II. *Synaptea* :—Fruit adnate in its lower part to the accrescent calyx, *i e.*, fruit half inferior.

Sect. I. Eu-Vatica.—Fruit quite free from the calyx.

Inflorescence and ripe fruit pale tomentose ; flowers ·4 in. long ... ... 1. *V. perakensis.*

Inflorescence and ripe fruit rusty-tomentose.

Flowers ·25 in. long ; nerves of leaves 13 to 15 pairs; petioles ·3 to ·4 in. long ... 2. *V. Lowii.*

Flowers ·45 in. long ; nerves of leaves 9 to 12 pairs ; petioles ·6 to 1·5 in. long... 3. *V. Maingayi.*

Sect. II. Synaptea —Calyx-wings adherent to the ripe fruit for nearly half its length.

Leaves 9 to 10 in. long and with 18 to 20 pairs of nerves ... ... 4. *V. nitida.*

Leaves 2·5 to 7 in. long, with 6 to 13 pairs of nerves.

Larger lobes of calyx of fruit obovate and very blunt.

Leaves with 6 to 8 pairs of faint nerves ... ... 5. *V. cinerea.*

Leaves with 11 to 13 pairs of bold nerves ... ... 6. *V. Curtisii.*

Larger lobes of calyx narrowly oblong.

Leaves oblong or elliptic-oblong, with 9 to 11 pairs of nerves ; petals narrowly oblong ... 7. *V. faginea.*

Leaves broadly elliptic, with 11 to 13 pairs of nerves ; petals broadly elliptic ... ... 8. *V. Dyeri.*

Leaves 2·5 to 3·5 in. long, with about 7 or 8 pairs of faint, main nerves, minutely reticulate. 9. *V. reticulata.*

1. Vatica perakensis, King, n. sp A tree 60 to 80 feet high; young branches slender, deciduously scurfily stellate-pubescent, the bark rather pale. *Leaves* thinly coriaceous, oblong-lanceolate, rarely oblanceolate, more or less bluntly acuminate, sometimes caudate, the base cuneate; both surfaces glabrous, the midrib on the upper puberulous; main nerves 10 to 12 pairs, rather prominent beneath; length 2·5 to 4 in., breadth ·8 to 1·3 in., petiole ·4 to ·5 in. *Panicles* axillary and extra-axillary, crowded near the ends of the branches, 1 to 2 in. long, minutely pale tomentose, as are the ovate-lanceolate calyx-lobes. *Flowers* ·4 in. long. *Petals* narrowly oblong, obtuse, glabrous. *Stamens* slightly apiculate. *Ovary* minutely tomentose; stigma conical. *Ripe fruit* ·3 in. in diam., globose, the style persistent, minutely tomentose, quite free from the calyx; the two accrescent calyx-lobes oblong-ob-lanceolate, obtuse, obscurely 5-nerved, 2·5 in. long and ·5 in. broad; minor lobes unequal, lanceolate-acuminate, the largest about ·85 in long.

Perak: King's Collector, Wray; a common tree. Pangkore: Curtis.

The nearest ally of this is *Vatica Bantamensis*, Benth. and Hook.; but that has rather larger and more coriaceous leaves, which are perfectly glabrous; larger flowers with petals scaly externally and a more scurfy inflorescence; moreover the whole of the accrescent calyx-lobes of its fruit are more coriaceous and the minor lobes are blunter.

2. Vatica Lowii, King, n. sp. A tree 60 to 80 feet high: young branches, petioles, inflorescence and calyx densely rusty, scurfy-tomentose with stellate hair intermixed, the branches ultimately glabrous and with dark bark. *Leaves* coriaceous, oblong, sub-acute, the base rounded; both surfaces glabrous, the midrib puberulous on the upper; main nerves 13 to 15 pairs, spreading, slightly prominent beneath; length 2·5 to 3·5 in., breadth 1 to 1·5 in., petiole ·3 to ·4 in. *Panicles* axillary and terminal, much crowded towards the ends of the branches; ·75 to 1·5 in. long. *Flowers* ·25 in. long. *Calyx-lobes* lanceolate, acuminate, oblique. *Petals* narrowly oblong, obtuse, almost glabrous. *Stamens* short, unequal-sided, apiculate. *Ovary* depressed, tomentose, style capitate. *Ripe fruit* globular, ·25 in. in diam, deciduously rufous-scurfy; the style persistent, quite free from the calyx. Two large calyx-wings narrowly oblong, sub-acute, scarcely narrowed at the base, 5-nerved, 2·75 to 3 in. long, and ·6 in. broad; the three smaller lobes sub-equal, about ·5 or ·6 in. long, lanceolate, obtuse.

Perak: Scortechini, No. 2108; King's Collector, No. 7496.

This species is closely allied to *V. Maingayi*, Dyer; but has smaller flowers, and rather larger leaves with considerably longer petioles.

3. Vatica Maingayi, Dyer, in Hook. fil., Fl., Br., Ind. I, 302. A tall tree: young branches slender, ultimately glabrous, but at first rusty furfuraceous-tomentose, as are the inflorescence, calyx and ripe fruit. *Leaves* coriaceous, oblong or obovate-oblong, shortly acuminate, the base rounded, glabrous on both surfaces; main nerves 9 to 12 pairs, slender, curving, spreading; length 3 to 4·5 in., breadth 1 to 1·75 in., petiole ·6 to 1·5 in. *Panicles* short, few-flowered. *Flowers* ·45 in. long. *Calyx-segments* oblong-lanceolate. *Ovary* depressed, rufous-tomentose. *Ripe fruit* globose, ·25 in. in diam., the style persistent, rufous-tomentose; free from the calyx; the two large wings linear-oblong, sub-acute, not contracted at the base, 5-nerved (the lateral nerves faint) 2 in. long and ·35 to ·5 in. broad; the 3 smaller lobes ovate, sub-acuminate, ·75 in. long, all glabrous.

Malacca: Maingay (Kew Distrib.) No. 209.

Of this I have seen only Maingay's specimens, which are not good.

4. Vatica nitens, King, n. sp. A tree 40 to 50 feet high: young branches and petioles densely covered with coarse deciduous scaly stellate tomentum, ultimately cinereous. *Leaves* coriaceous, narrowly oblong, acuminate, slightly narrowed to the rounded base; both surfaces, but especially the upper, shining, glabrous, the base on the lower sparsely scaly-tomentose when young, finely reticulate; main nerves 18 to 20 pairs, spreading, prominent on the lower surface: length 9 to 10 in., breadth 2 in.; petiole ·5 in., stout. *Ripe fruit* globular, crowned by the persistent style, reticulate, ·5 in. in diam., adnate for half its length to the calyx; the two large wings of the calyx oblong, slightly ob-lanceolate, obtuse, 3 in. long and ·8 to ·9 in. broad, the 3 shorter wings ovate-acuminate, ·8 in. long; all boldly 5-nerved and shining.

Penang: Curtis, No. 1404.

This fine species is known only by Mr. Curtis' imperfect specimens. It is very distinct, being at once recognisable amongst the Indian species of *Vatica* by the size of its leaves and calyx-wings.

5. Vatica cinerea, King, n. sp. A tree about 40 feet high: young branches rufescent-puberulous at the very tips, otherwise glabrous and cinereous. *Leaves* thinly coriaceous, ovate-oblong to ovate-lanceolate, sub-acute, the base rounded or sub-cuneate; both surfaces glabrous, finely reticulate when dry; main nerves 6 to 8 pairs, spreading, faint; length 2·25 to 3·5 in., breadth ·75 to 1·5 in., petiole ·3 to ·5 in. *Panicles* mostly axillary, spreading, rusty scurfy-tomentose, 1·25 to 2 in. long. *Flowers* ·45 in. long. *Calyx-lobes* sub-equal, lanceolate, sub-acute, tomentose on both surfaces. *Petals* oblong-lanceolate, sub-acute, the half of the outer surface which is outside in æstivation pubescent, other-

wise glabrous. *Stamens* obtusely apiculate. *Ovary* depressed, minutely tomentose; stigma capitate. *Fruit* (not quite ripe) globular, umbonate, attached for half its length to the calyx. The two larger calyx-wings ob-lanceolate-oblong, obtuse or sub-acute, 5-nerved, flocculent-puberulous near the base when young, ultimately glabrous, 2 in. long and ·5 in. wide; the 3 smaller wings lanceolate, obtuse, ·5 in. long.

Langani: Curtis, Nos. 2797 and 2798. Kedah: Curtis, Nos. 2096 and 2514.

When dried, the leaves of this are of a dull gray colour—hence the specific name. Its fruit resembles that of the next species, but the leaves have fewer and less prominent nerves.

6. Vatica Curtisii, King, n. sp. A tree about 40 feet high: young branches, petioles, inflorescense and calyx brownish scurfy-pubescent, ultimately glabrous. *Leaves* ovate-oblong, sub-acute, the base rounded, both surfaces quite glabrous, reticulate; main nerves 11 to 13 pairs, oblique, rather prominent beneath; length 3 to 5 in., breadth 1·3 to 2·5 in., petiole ·3 to ·45 in. *Racemes* axillary, few-flowered, 1 to 1·25 in. long. *Flowers* ·35 in. long. *Calyx-lobes* unequal, the 2 longer narrowly oblong, obtuse; the 3 shorter lanceolate-acuminate. *Petals* elliptic, slightly oblique, blunt, glabrous except the pubescent edge which is external in the bud. *Ripe fruit* globular, ·3 in. in diam., adherent to the calyx for half its length, the larger calyx-lobes oblong-obovate, usually obtuse, rarely sub-acute, 5-nerved, 1·75 to 2 in. long, and ·7 in. broad; the smaller wings about ·4 in. long.

Penang: Curtis, No. 1579.

7. Vatica faginea, Dyer in Hook. fil. Fl. Br. Ind., I., 301. A tree 80 to 100 feet high: young branches slender, minutely cinereous stellate-tomentose as is the inflorescence. *Leaves* coriaceous, oblong or elliptic-oblong, finely reticulate, glabrous; main nerves 9 to 11 pairs, spreading, curving, thin but prominent when dry; length 4 to 5 in., breadth 1·5 to 2 in. *Panicles* 2·5 in. long; flowers ·5 in. long. *Calyx-tube* ribbed, minutely scurfy tomentose, the lobes unequal. *Petals* narrowly oblong, blunt, glabrous except the pubescent outside edge. *Ovary* hemispheric, minutely tomentose; stigma capitate, lobed. *Ripe fruit* globular, adherent for half its length to the calyx, about ·25 in. in diam., the style persistent; the 2 larger calyx-wings narrowly oblong, or oblong-oblanceolate, obtuse, obscurely 5-nerved, 2 to 2·5 in. long, and ·5 to ·7 in. broad near the apex; the three smaller wings unequal, sub-spathulate, less than ·5 in. long. *Hopea faginea*, Wall. Cat. 963 *Shorea pinangiana*, Wall., Cat. p. 157. *Synaptea faginea*, Pierre, For. Flore Coch.-Chine, t. 242.

Penang: Wallich. Perak: King's Collector, Nos. 3686 and 3765.

8. Vatica Dyeri, King, n. sp. A tree 80 to 130 feet high: young branches, panicles, and calyx on both surfaces densely rufous-flocculent-tomentose, with stellate hairs intermixed, the branches ultimately glabrous and their bark pale. *Leaves* membranous, usually broadly elliptic, rarely elliptic-oblong, sub-acute or very shortly and bluntly acuminate, the base rounded, both surfaces quite glabrous, finely reticulate: main nerves 11 to 13 pairs, spreading, rather prominent beneath: length 3·5 to 7 in., breadth 1·6 to 3 in.; petiole ·35 to ·5 in., flocculent-tomentose. *Panicles* axillary or terminal, cymose, 1·5 to 3 in. long. *Flowers* ·4 in long. *Calyx lobes* unequal, the two larger oblong and obtuse; the three smaller lanceolate, acuminate. *Petals* broadly elliptic, very obtuse, slightly narrowed to the truncate base, much larger than the calyx-lobes, glabrous, except one of the outside edges which is adpressed-pubescent. *Stamens* short, unequal-sided, bluntly apiculate. *Ovary* depressed-pubescent, the stigma capitate. *Ripe fruit* conical, the two large accrescent calyx-wings narrowly oblanceolate-oblong, blunt, 5-nerved, 1·25 in. long and ·25 in. broad; the three smaller wings one-fourth of the size of the larger, lanceolate, obscurely 5-nerved. *Synaptea Dyeri*, Pierre Fl. Forest. Coch-Chine, t. 241.

Perak: King's Collector, No. 7662. Distrib., Cambodia, Lower Cochin-China, Pierre.

The Perak specimens are not in fruit: but in flowers and leaves they agree with Pierre's specimens from Cambodia and Cochin-China.

9. Vatica reticulata, King, n. sp. A tree 60 to 80 feet high: all parts except the inflorescence glabrous; young branches slender, dark-coloured. *Leaves* coriaceous, oblong to ovate-lanceolate, tapering from the middle to each end; the apex bluntly acuminate, the base very cuneate and slightly unequal-sided, the edges sub-undulate; both surfaces finely reticulate when dry, the lower paler; main nerves 8 or 9 pairs, little more prominent than the secondary; length 2·5 to 3·5 in., breadth 1 to 1·25 in., petiole ·4 in. *Panicles* axillary or terminal, puberulous, 2·5 to 3·5 in. long, lax, few-flowered. *Flowers* on long pedicels. *Calyx-lobes* unequal, lanceolate, more or less obtuse, densely pubescent on both surfaces. *Ovary* hemispherical, ridged, densely tomentose; style short, glabrous; stigma minute. *Young fruit* subglobular; fruiting calyx with 2 accrescent linear-oblong wings, the other smaller; all attached to the lower part of the fruit.

Perak: King's Collector, No. 6969.

The only specimens which I have seen of this are without corolla, stamens, or ripe fruit. The species is, however, a very distinct one, and it is an unmistakeable *Vatica*. I have therefore ventured to name it in spite of the imperfection of the material.

4. Pentacme, A. DC.

Glabrous or puberulous resinous trees. *Leaves* broad, entire, penni-nerved, with obtuse or cordate bases. *Flowers* large, panicled. *Calyx-tube* short, the lobes imbricate, 2 being quite external. *Stamens* 15, the filaments short, dilated; anthers much larger than the filaments, elongate, linear; the valves 4, sub-equal, each subulate at its apex, the connective also prolonged into a stiff deflexed arm as long as the appendages of the anther-valves. *Ovary* free; the style filiform, the stigma slightly lobed. *Fruit* enclosed within the imbricate calyx-lobes, of which two or more have elongated membranous reticulate many-nerved wings. Species 3,—Burmese, Siamese, and Malayan.

1. Pentacme malayana, King, n. sp. A tree 40 to 50 feet high: young branches rather stout, dark-coloured, glabrous. *Leaves* sub-coriaceous, rotund-ovate to broadly elliptic, the apex shortly and bluntly acuminate, the base rounded or slightly emarginate; both surfaces glabrous, pale when dry; main nerves 15 to 18 pairs, spreading, prominent on both surfaces; length 5 to 7 in., breadth 2·75 to 4·5 in., petiole ·75 to 1·1 in. *Panicles* axillary, lax, few-flowered, 2·5 to 5 in. long. *Flowers* ·75 in. long and about as much in diameter when open, pedicelled. *Calyx-lobes* more or less broadly ovate, acuminate, minutely tomentose outside. *Petals* three times as long as the calyx, elliptic, spreading, puberulous on one-half outside, and glabrous on the other, quite glabrous inside. *Stamens* 15, equal, erect, the filaments short and broad; the anthers elongate, narrow, with 5 apical awns, one of which is deflexed and rather shorter and thicker than the other four. *Ovary* ovoid, sub-glabrous, much shorter than the filiform style: stigma minute. *Ripe fruit* ovate, apiculate, 1 in. long, glabrous; calyx-wings all enlarged and reticulate except at the base; the three outer narrowly oblong, obtuse, and narrowed to the concave base, 9-nerved, 4 to 4·5 in. long, and ·65 to ·75 in. broad; the two inner lobes much narrower and fewer-nerved, about 2·5 in. long, or even shorter.

Langkani: Curtis, No. 2095.

The petals of this species are spreading, and the flower has quite an unusual *facies* for the order. It is at once distinguished by its curiously 5-awned anthers. Four of these awns are the produced apices of the anther cells, the fifth (the thicker and deflected one) is a prolongation from the connective.

5. Shorea, Roxb.

Glabrous, mealy, or pubescent resinous trees. *Leaves* entire or sub-repand, pinnate-veined; stipules large, coriaceous and persistent, or minute and fugacious. *Flowers* in axillary or terminal, lax, cymose

panicles; bracts persistent, caducous, or 0. *Sepals* ovate or lanceolate, imbricate, 3 being external and 2 internal. *Stamens* 15 or 20, or 30; anthers ovate or oblong, rarely linear; connective subulate-cuspidate, rarely inappendiculate; valves obtuse, rarely cuspidate, equal, or the outer slightly larger. *Ovary* 3-celled, cells 2-ovuled; style subulate, stigma entire or 3-toothed. *Fruit* with leathery, rarely with woody, pericarp, 1-celled, 1-seeded, closely surrounded by the bases of the persistent, usually accrescent, sepals, the 3 outer, or more rarely, all, and sometimes none, of which are developed into 7- to 10-veined reticulate membranous linear-oblong wings. *Cotyledons* fleshy, unequal, usually enclosing the superior radicle. Distrib—Tropical Asia and chiefly the Malayan Archipelago: species about 60.

Sect. I. Eu.-Shorea. Fruit little more than ·5 in. long, its pericarp leathery: three of the persistent sepals developed into membranous wings many times longer than the fruit.

Anthers without apical appendages.

Lower surface of adult leaves minutely stellate-tomentose, not scaberulous ... 1. *S. leprosula.*

Lower surface of adult leaves glabrescent, the axils of the nerves scaly ... 2. *S. scutulata.*

Lower surface of adult leaves quite glabrous, of young leaves glaucous ... 3. *S. Curtisii.*

Anthers mostly inappendiculate, a few with a minute apical appendage from the connective.

Stamens 30 ... ... 4. *S. sericea.*

Anthers with very short apical appendages from the connective; flowers sessile.

Leaves 2·5 to 4 in. long, the lower surfaces minutely pubescent: flower ·25 in. long; fruit ovoid-globose, its largest wings 2·5 in. long 5. *S. parvifolia.*

Leaves 3 to 4·5 in. long, glabrous beneath: flower ·3 in. long: fruit turbinate, its largest wings 3·5 in. long ... ... 6. *S. acuminata.*

Leaves 4 to 6 in. long, glabrescent or glabrous beneath; fruit narrowly ovoid, its longest wings 3·5 to 4·5 in. long. ... 7. *S. macroptera.*

Apical appendage from the connective much longer than the anther.

Leaves glabrous on both surfaces, the lower not pale.

Stamens 10 (?) ... ... 8. *S. Maxwelliana.*

Stamens 20 ... ... 9. *S. gratissima.*

Stamens 15
Flowers ·2 to ·25 in. long.
Main nerves of leaves 9 to 10 pairs, faint; petals not saccate at base; ovary ovoid-conical, tomentose, style short ... ... 10. *S. Ridleyana.*
Main nerves 6 or 7 pairs; petals saccate at base; ovary hemispheric, style long and slender ... 8. *S. Maxwelliana.*
Flowers ·4 in. long, main nerves 9 to 11 pairs; style 3 times as long as the globose ovary ... ... 11. *S. pauciflora.*
Flowers ·5 in. long, main nerves of leaves 6 to 8 pairs; ovary elongate-conic, style short, petals linear-oblong ... ... 12. *S. Kunstleri.*
Flowers ·65 in. long: nerves of leaves 12 to 16 pairs; ovary ovoid, style long, filiform, petals ovate-lanceolate 13. *S. bracteolata.*
Leaves glaucous beneath ... ... 14. *S. glauca.*
Apical appendage of the connective with 3 to 5, or many ciliæ.
Stamens 30: ciliæ radiating from the tip of the apical process of all the anthers 15. *S. ciliata.*
Stamens 20: apical appendages of all the anthers with numerous ciliæ; petals broad, spreading ... ... 16. *S. utilis.*
Stamens 15: anthers of outer row with ciliate apical appendages ... ... 17. *S. costata.*
Anthers with a single apical appendage from each cell, and a short one from the connective; sepals imbricate at their bases only ... 18. *S. stellata.*

Species imperfectly known.

Bracteoles large, persistent, scaberulous, stellate-pubescent ... ... 19. *S. Maranti.*
Stipules large, paired, persistent ... 20. *S. eximia.*

Sect. II. Pachychlamys, (Dyer). Fruit more than 1 in. long, its pericarp thick and woody, embraced in its lower half by a cup formed of the enlarged sepals, the bases of which are thickened woody and concave, the apices of the outer three produced into membranous wings as long as, or slightly longer than, the fruit.

Anthers of inner row inappendiculate, those of the other two rows appendiculate ... 21. *S. Thiseltoni.*

1. Shorea leprosula, Miq. Fl. Ind. Bat. Suppl. I., 487. A tree 100 to 150 feet high: young branches rather slender, lenticellate, minutely and deciduously pale stellate-tomentose. *Leaves* coriaceous, elliptic to oblong, acute or sub-acute, the base rounded; upper surface glabrous, harsh from the prominent minute reticulations, the midrib and nerves sometimes puberulous; lower surface minutely fuscous-tomentose, with numerous densely stellate hairs on the midrib nerves and veins; main nerves 10 to 13 pairs, straight, oblique, prominent beneath; length 3 to 6 in., breadth 1·25 to 3·25 in., petiole ·35 to ·75 in. *Panicles* axillary and terminal, 1·5 to 4 in. long, rachis and branches stellate-tomentose, the short flower-bearing branchlets sericeous. *Flowers* in two rows, secund, ·3 in. long, sessile. *Sepals* ovate, minutely velvety outside. *Petals* three times as long as the sepals, sericeous outside, oblong-spathulate. *Stamens* about 15; the filaments dilated, much longer than the short ovate inappendiculate anthers. *Ovary* ovoid, minutely tomentose, tapering upwards into the long slender style; stigma minute. *Ripe fruit* narrowly ovoid, apiculate, minutely tomentose, 6 in. long. *Calyx-wings* all enlarged and membranous, concave at the base so as to embrace the ripe fruit, but not adnate to it; the three outer narrowly oblong, sub-acute at the apex, narrowed at the base, 7-nerved, reticulate, 3 in. long and about ·7 in. broad; the two inner smaller, about 1 in. long, ovate, caudate-acuminate, not nerved. A. DC. Prod. XVI. 2, 631. Scheff. in Tijdschr. Ned. Ind. XXXI, 350: Hook. fil. Fl. Br. Ind., I., 305. Burck in Ann. Jard. Bot. Buitenzorg, VI, 215. *Shorea astrosticta*, Scortechini MSS.

Malacca: Maingay (Kew. Distrib.), No. 203. Perak, King's Collector, Nos. 7646, 7905, 8182; Scortechini, No. 2063. Distrib. Sumatra.

2. Shorea scutulata, King, n. sp. A large tree; young branches with dark lenticellate bark and minute white stellate pubescence. *Leaves* elliptic, shortly abruptly and bluntly acuminate; the base broad, rounded, almost truncate: upper surface glabrous, minutely reticulate; the lower, and especially the midrib, sparsely stellate-puberulous when young, glabrescent when old, the sides of the midrib, and especially the pits in the axils of the nerves, with numerous minute brownish pale-edged scales; length 3 to 3·5 in., breadth 1·5 to 1·75 in., petiole ·3 in. *Panicles* axillary and terminal, 3 to 4 in. long, the branches short, each bearing 2 or 3 bracteolate flowers; bracts broadly ovate, concave, blunt, hoary-puberulous, deciduous. *Flowers* ·4 in. long, shortly pedicelled. *Sepals* broadly lanceolate, obtuse, tomentose outside, glabrous inside. *Petals* oblong, obtuse, the base expanded

at one side, glabrous inside and on one half outside, pubescent on the other. *Stamens* 15, in 3 rows; all the filaments broad, those of the outer two rows shorter than those of the inner: anthers short, broadly ovate, inappendiculate. *Ovary* conical, pale tomentose: style short, stigma small. *Fruit* (perhaps not mature) ovoid, apiculate, minutely pale tomentose, ·6 in. long. *Sepals* all enlarged, membranous, reticulate, concave at the base; the three outer narrowly oblong, obtuse, very little narrowed to the base, 7-nerved, 2·75 in. long and ·75 in. broad; the two inner ·8 in. long, linear, about 1-nerved.

Penang: Curtis, No. 1396.

A species known only from Penang, and collected only by Mr. Curtis: remarkable for its almost racemose inflorescence, and curiously glandular leaves.

3. Shorea Curtisii, Dyer MSS. in Herb. Kew. A tree 100 to 150 feet high; young branches slender, at first minutely stellate-puberulous, ultimately dark-coloured and glabrous. *Leaves* coriaceous, oblong-lanceolate, bluntly acuminate; the base sub-cuneate, or almost rounded; upper surface of young leaves minutely pubescent, of adults glabrescent or quite glabrous, the lower uniformly covered with very minute rufescent (young), or pale (adult) tomentum: main nerves 10 to 14 pairs, ascending, rather straight, prominent beneath: length 3 to 4 in., breadth 1·2 to 1·4 in., petiole ·4 to ·6 in. *Panicles* axillary or terminal, 2 to 3 in. long, the rachis slender, glabrous. *Flowers* about ·3 in. long, in distichous secund rows of 4 or 5, on the short lateral branchlets, enveloped while in bud by broad deciduous puberulous bracts. *Sepals* ovate, tomentose outside, glabrous inside, slightly unequal. *Petals* twice as long as the calyx, linear-oblong, obtuse, stellate-pubescent outside, glabrous inside. *Stamens* 15, in three rows; the filaments elongate, broad (those of the outer row longest); anthers short, ovoid-globose, not apiculate. *Ovary* elongated ovoid, tomentose in the upper, glabrous in the lower half: *style* short, *stigma* small. *Ripe fruit* narrowly ovoid, apiculate, ·75 in. long, pale tomentose; *calyx-wings* all enlarged and membranous, free from the fruit: the three outer linear-oblong, 8-nerved, 2·25 in. long, and about ·5 in. broad; the two inner about 1 in. long, bluntly spathulate and with fewer nerves.

Penang: Curtis, Nos. 427, 1394 and 1395.

Perak: King's Collector, No. 8143.

The vernacular name of this in Penang is *Maranti Tai.*

4. Shorea sericea, Dyer in Hook. fil. Fl. Br. Ind., I., 306. A tree 50 to 60 feet high; young branches rugulose, warted and scurfily

rufous-tomentose as are the inflorescence and petioles. *Leaves* coriaceous, oblong or elliptic-oblong (rarely slightly ob-ovate), very shortly acuminate or sub-acute, slightly narrowed to the rounded or subcuneate base; upper surface shining, sparsely stellate-tomentose, the depressed midrib and nerves puberulous; lower surface scaberulous, more densely stellate-pubescent, especially on the bold midrib and 20 to 22 pairs of stout spreading main nerves; length 3·5 to 6·5 in., breadth 1·5 to 2·75 in., petiole ·6 to ·8 in. *Panicles* axillary and terminal, 3 to 7 in. long, the ultimate branches bearing 4 or 5 distichous, secund, bracteate, sessile flowers; bracts broadly ovate, puberulous outside. *Sepals* ovate, the two inner smaller, all densely golden-sericeous outside, glabrous inside. *Petals* like the sepals and of about the same length, the inside and one-half of the outer glabrous, the other half adpressed-sericeous. *Stamens* about 40, in several rows; the filaments of the outer shorter, all longer than the anthers; anthers ovate, mostly inappendiculate, a few with a minute appendix. *Ovary* elongated, conic, sericeous; the style short, glabrous; stigma small. *Fruit* (immature) narrowly ovoid, ·5 in. long, embraced by, but not adnate to, the accrescent membranous calyx-wings: the outer 3 calyx-wings linear-oblong obtuse, narrowed to the base, 3·5 in. long and ·6 in. broad, 10-nerved; the 2 inner 2·5 in. long and much narrower and fewer-nerved, sparsely pubescent.

Malacca: Maingay (Kew. Distrib.) No. 202. Penang: Curtis, No. 431. Perak: King's Collector, No. 3511.

This resembles *S. lacunosa* Scheff., but differs in not having persistent stipules. Its vernacular name in Penang is *Seraya*.

5. Shorea parvifolia, Dyer in Hook. fil. Fl. Br. Ind., I., 305. A tree 100 to 150 feet high; young branches slender, pale tomentose at first, ultimately glabrous, dark-coloured and lenticellate. *Leaves* coriaceous, ovate to ovate-lanceolate, caudate-acuminate, the base subcuneate or almost rounded; upper surface glabrous (when young the midrib tomentose or pubescent); under surface sparsely scaly-pubescent when young, when adult minutely pubescent, the transverse veins thick; main nerves 9 to 12 pairs, oblique, rather straight, prominent beneath: length 2·5 to 4 in., breadth 1 to 1·8 in.; petiole ·35 to ·45 in., tomentose when young. *Panicles* axillary and terminal, crowded near the ends of the branches, 2 to 4 in. long, rather lax, spreading, many-flowered, minutely tomentose, the branches distichous. *Flowers* ·25 in. long, secund, distichous, deciduously bracteate. *Sepals* slightly unequal, ovate, acute, tomentose outside, glabrous inside. *Petals* twice as long as the sepals, obliquely elliptic, obtuse, glabrous, except on one-half outside which is silky. *Stamens* 15, or fewer: the filaments flatten-

ed, about 4 times as long as the broad short anthers; apiculus of connective very slender, about as long as the anther, deflexed. *Ovary* elongate, puberulous; style rather short; stigma small. *Ripe fruit* ovoid-globose, ·4 in. long, thinly adpressed pale tomentose. *Sepals* all enlarged and membranous, concave at the base so as to embrace the ripe fruit, but not adnate to it: the three outer narrowly oblong, obtuse at the apex, slightly narrowed to the base; 7-nerved, 2·5 in. long; the two inner from one-half to one-third shorter, narrower and fewer nerved. *Shorea disticha*, Scortechini MSS. in Herb. Calcutta.

Malacca: (Kew Distrib.) No. 206. Penang: Curtis, No. 201. Perak: Scortechini, No. 1965. Wray, No. 1282.

6. Shorea acuminata, Dyer in Hook. fil. Fl. Br. Ind., I., 305. A tree 100 to 150 feet high; young branches minutely greyish tomentose, ultimately dark-coloured and glabrescent. *Leaves* coriaceous, ovate to lanceolate, acuminate, the base often unequal-sided, rounded or sometimes emarginate; upper surface glabrous except the puberulous midrib; the flower glabrous, with a few scattered stellate hairs: main nerves 7 to 9 pairs, spreading, slightly prominent beneath: length 3 to 4·5 in, breadth 1·75 to 2·5 in.; petiole ·3 to ·4 in., tomentose. *Panicles* axillary and terminal, crowded near the extremities of the branches, 2 to 3 in. long, minutely stellate-pubescent, many-flowered. *Flowers* ·3 in. long, distichous, secund, about 5 on each lateral branch, bracteolate. *Sepals* ovate, unequal, tomentose outside, glabrous inside. *Petals* twice as long as the calyx, spreading, broadly ovate, puberulous outside, glabrous inside. *Stamens* 15, in three rows, the inner row shorter: filaments broad, much larger than the short, ovate, minutely appendiculate anthers. *Ovary* ovoid, tapering, pubescent: style short, stigma small. *Ripe fruit* turbinate, with 3 slightly vertical grooves, apiculate, puberulous, ·5 in. in diam., attached by its base to the calyx: *sepals* all enlarged, concave at the base so as completely to cover the fruit, membranous and reticulate; the 3 outer narrowly oblong obtuse, contracted towards the base, 10- or 11-nerved, 3·5 in. long, and 7 in. broad; the two inner 1 to 1·5 in. long, under ·25 in. broad, 3- to 4-nerved.

Malacca: Maingay (Kew Distrib.) No. 205 (?). Griffith, No. 1762.

Perak: King's Collector, No. 8009.

7. Shorea macroptera, Dyer in Hook. fil. Fl. Br. Ind. I, 308. A tree 60 to 80 feet high: young branches with dark-brown bark, minutely lenticellate and puberulous. *Leaves* coriaceous, oblong (usually narrowly), shortly acuminate, the base sub-cuneate or rounded: upper surface glabrous, shining, the midrib and nerves puberulous: lower

surface glabrescent or glabrous, chocolate-coloured when dry: main nerves 10 to 12 pairs, curved, spreading, prominent on the lower surface; length 4 to 6 in., breadth 1·35 to 1·75 in.; petiole ·4 to ·5 in., rugose. *Panicles* axillary or terminal, 4 to 7 in. long, lax, branching, few-flowered, puberulous, sparsely scaly. *Flowers* about ·5 in. long, sessile, solitary, not secund. *Sepals* distinct almost to the base, slightly unequal, broadly-ovate, acute, more or less yellowish-tomentose outside, glabrous inside. *Petals* narrowly oblong, slightly oblique at the base, the apex blunt, glabrous except one-half of the outer surface which is sericeous. *Stamens* 15, in two rows; filaments broad except at the apex, those of the outer two rows by much the shorter: anthers short, ovate, the connective minutely awned. *Ovary* elongated-ovoid, sericeous in its upper half; style short, stigma small. *Ripe fruit* ·6 to ·75 in. long, narrowly ovoid, pale puberulous, apiculate: *sepals* all enlarged and reticulate, slightly concave at the base and embracing, but not adnate to, the fruit; the three outer narrowly oblong, obtuse, tapering slightly to the auricled base, 7-nerved, 3·5 to 4·5 in. long, and ·8 to 1 in. broad; the two inner variable, but shorter, narrower and fewer nerved. *Shorea auriculata*, Scortechini MSS. in Herb., Calcutta.

Malacca: Maingay. Singapore: Ridley. Penang: Curtis, No. 1392. Perak: very common, King's Collector, Scortechini.

A species from Borneo which closely resembles this appears to me to differ specifically. Its leaves are longer with sparser nerves, and its calyx-wings are longer.

8. Shorea Maxwelliana, King, n. sp. A tree 60 to 80 feet high: young branches dark-coloured, almost glabrous. *Leaves* coriaceous, ovate-lanceolate, acuminate (caudate-acuminate when young), the base unequal-sided, cuneate; both surfaces quite glabrous, the upper shining, the lower chocolate-coloured when dry: main nerves 6 or 7 pairs, curved, spreading, thin and inconspicuous: length 3 to 4 in., breadth 1·3 to 1·5 in., petiole ·4 in. *Panicles* axillary and terminal, 2·5 to 3 in. long, stellate-puberulous, their lateral branches very short and few-flowered. *Flowers* shortly pedicelled. *Sepals* unequal, oblong, blunt, with enlarged concave bases, more or less pubescent, but glabrous in the concavity of the base inside. *Petals* oblong, concave and saccate at the base, tomentose outside, glabrous inside. *Stamens* 10 (?), the filaments short, broad; the anthers elongate, erect, pointed, the connective ending in an awn as long as the anther. *Ovary* hemispheric; the style long, slender; stigma minute. *Fruit* (not mature) globular, minutely tomentose, closely invested by, but not adnate to, the concave bases of the sepals: *sepals* all enlarged, membranous, narrowly oblong, obtuse;

the three outer 7-nerved, 1·5 in. long and ·4 in. broad; the two inner similar in shape, but fewer-nerved and only ·5 in. long.

Perak: King's Collector, Nos. 3601 and 3744.

The only flowers of this species which I have seen are in an early stage of bud, and from them I am unable to make out the characters of the petals properly. The stamens appear to be only 10 in number: but of this I cannot now be quite certain.

9. Shorea gratissima, Dyer in Hook. fil. Fl. Br. Ind. I, 307. A tree: younger branches slender, glabrescent, dark-coloured. *Leaves* coriaceous, elliptic, acuminate, the base broad and rounded, the margins sub-undulate, both surfaces glabrous: main nerves 12 to 14 pairs, faint; length 2·5 to 4 in., breadth 1·25 to 1·5 in., petiole ·6 to ·75 in. *Panicles* axillary and terminal, lax, few-flowered, 3 to 6 in. long, sub-puberulous. *Flowers* secund, pedicelled, ·25 in. long. *Sepals* lanceolate, sub-acute; minutely tomentose outside, glabrous inside in the lower, adpressed-pubescent in the upper, half. *Petals* twice as long as the calyx and much broader, elliptic, obtuse, glabrescent. *Stamens* about 20; the filaments short, unequal, dilated. *Anthers* elongated-ovate, truncate, each with a terminal awn from the connective twice as long as itself. *Ovary* ovoid, sub-glabrous; stigma small. *Ripe fruit* unknown. *Hopea gratissima*, Wall. Cat. 960.

Singapore: Wallich.

This is known only by Wallich's specimens. He referred it to *Hopea*, of which genus it certainly has the *facies:* the æstivation of the sepals is moreover that of *Hopea*, and so is the apiculus of the connective of the stamens. The petals in shape, however, resemble those of *Shorea*. I retain it in *Shorea* in deference to the opinion of Mr. Dyer.

10. Shorea Ridleyana, King, n. sp. A tree 60 or 80 feet high: young branches slender, dark brown, lenticellate, nearly glabrous. *Leaves* ovate-lanceolate, shortly acuminate, the base rounded: both surfaces glabrous, the upper shining: main nerves 9 or 10 pairs, curved, spreading, thin but slightly prominent beneath: length 2·5 to 4 in., breadth 1·1 to 2 in.; petiole ·4 to ·5 in., rugulose. *Panicles* axillary and terminal, 1·5 to 2 in. long, densely stellate-puberulous. *Flowers* ·2 in. long, pedicellate. *Sepals* sub-equal, oblong, obtuse, tomentose outside, glabrous inside. *Petals* oblong, slightly oblique, obtuse, glabrous inside, puberulous outside on one half, glabrous on the other. *Stamens* 15, sub-equal, the filaments dilated in the lower half: anthers shorter than the filaments, ovate, the connective produced into an awn longer than the anther. *Ovary* ovoid-conical, minutely tomentose. *Style* short; stigma minute. *Fruit* (immature) ovoid, apiculate, minutely

pale tomentose: *sepals* all enlarged, membranous, reticulate and concave at the base; the three outer linear-oblong, obtuse, slightly narrowed to the concave base, 5-nerved, 2·25 in. long and ·4 in. broad; the two inner of the same shape, but only 1-nerved, narrower and only 1·5 in. long.

Perak: King's Collector, Nos. 3571 and 3617.

This a good deal resembles *S. Maxwelliana*, King; but its leaves have more nerves, its slightly oblique petals are not saccate at the base, its ovary is ovoid-conical, and minutely tomentose with a short style; whereas in *S. Maxwelliana* the petals are saccate at the base, and the ovary is hemispheric with a long style.

11. Shorea pauciflora, King, n. sp. A tree 50 to 90 feet high: young branches slender, their bark brown puberulous and lepidote. *Leaves* thinly coriaceous, from oblong to elliptic, shortly acuminate; the base abruptly cuneate, slightly unequal-sided, or (in the elliptic forms) almost rounded: main nerves 9 to 11 pairs, oblique, straight, prominent beneath: length 4 to 5 in., breadth 1·8 to 2·5 in., petiole ·6 to ·7 in. *Panicles* few, axillary or terminal, few-flowered, 1·75 to 4 in. long, rather coarsely pubescent. *Flowers* ·4 in. long, secund, shortly pedicellate, each subtended by an ovate, solitary, puberulous, deciduous bract. *Sepals* broadly ovate, tomentose outside, glabrous inside. *Petals* broadly elliptic, obtuse, concave at the base, veined, inside glabrous, the outside half glabrous and half adpressed-sericeous. *Stamens* 15, in 3 rows: the outer row smaller and with filiform filaments, the inner rows with filaments longer and expanded in the lower half; the anthers of all shortly ovate, the connective produced into an awn twice as long as the stamen. *Ovary* hemispheric, tomentose; style nearly 3 times as long, puberulous; stigma small. *Ripe fruit* unknown.

Penang: Curtis, No. 1537.

A species known only by Mr. Curtis' specimens which have no fruit.

12. Shorea Kunstleri, King, n. sp. A tree 60 to 100 feet high: young branches slender, rusty-puberulous, their bark brown. *Leaves* coriaceous, elliptic, abruptly and shortly acuminate, the base rounded or slightly cuneate, both surfaces glabrous, the lower with a few stiff white hairs on the midrib and nerves; main nerves 6 to 8 pairs, curved, ascending, prominent on the lower surface; length 4 to 5 in., breadth 2 to 2·4 in., petiole ·5 in. *Panicles* axillary and terminal, 4 to 6 in. long, lax, few-flowered, scaly-puberulous. *Flowers* ·5 in. long, sub-sessile, 4 or 5 together on the short branches of the panicles, secund, bracteate: the bracts broadly ovate, puberulous. *Sepals* sub-equal,

broadly ovate, acute, tomentose outside ; the edges ciliate, glabrous inside. *Petals* linear-oblong, obtuse ; the bases obliquely expanded, sericeous externally, glabrous internally. *Stamens* 15, sub-equal, the filaments as long as the anthers, flattened ; anthers ovate, short, the connective terminated by a curved awn much longer than the stamen. *Ovary* elongate-conic, puberulous ; style short. *Ripe fruit* hemispheric, tapering into a cone and crowned by the style, adpressed pale tomentose. *Sepals* membranous, reticulate : the three larger narrowly oblong, obtuse, tapering to the concave non-reticulate base, 9-nerved, 3·5 in. long and ·7 in. broad : the two inner 2 in. long, linear, 3-nerved.

Perak : King's Collector, Nos. 3474 and 3705.

This species is allied to *S. bracteolata*, Dyer, but its leaves have fewer nerves, smaller flowers, narrower petals, and a short style.

13. Shorea bracteolata, Dyer in Hook. fil. Fl. Br. Ind. I, 305. A tree 50 to 150 feet high ; young branches minutely furfuraceous-puberulous, speedily glabrescent, their bark dark-coloured. *Leaves* coriaceous, elliptic-oblong, shortly acuminate (often sub-obtuse when old), narrowed slightly to the rounded or emarginate base ; upper surface quite glabrous ; the lower yellowish furfuraceous-puberulous to glabrous ; main nerves 12 to 16 pairs, spreading, prominent beneath : length 4 to 6 in., breadth 1·6 to 2·5 in., petiole ·45 to ·6 in. *Panicles* axillary, few-flowered, 2·5 to 6 in. long, glabrous. *Flowers* ·65 in. long, shortly pedicellate, each subtended by 2 elliptic, obtuse, 3-nerved, puberulous, deciduous bracts ·35 in long. *Sepals* lanceolate, obtuse, minutely tomentose outside, the two inner smaller. *Petals* ovate-lanceolate, obtuse ; the bases expanded, glabrous. *Stamens* 15, in two rows, the filaments less than half as long as the ovate obtuse anthers ; appendix of connective subulate, twice as long as the anther, decurved when old. *Ovary* ovoid, attenuated upwards, sub-glabrous ; the style long, filiform ; stigma small. *Ripe fruit* ovoid, apiculate, ·6 in. long, embraced by, but (except at the very base) free from the calyx ; *sepals* accrescent, membranous, reticulate and concave at the base : the three outer narrowly oblong, blunt, slightly narrowed above the concave base, 10-nerved, 3·5 in. long, and ·6 in. broad ; the two smaller about 2 in. long, and ·2 in. broad, about 3-nerved. *Shorea foveolata*, Scortechini MSS. in Herb. Calcutta.

Malacca : Maingay (Kew Distrib.) No. 204. Penang : Curtis, Nos. 322 and 1405. Perak : King's Collector, Nos. 7583, 7591, 7717 ; Scortechini, No. 1939. Distrib.—Sumatra. Forbes, No. 3050.

14. Shorea glauca, King, n. sp. A tree 80 to 100 feet high ; young branches slender, dark-coloured, puberulous. *Leaves* coriaceous, ovate-lanceolate, acuminate ; the base broad, rounded ; upper surface

glabrous, the lower glaucous (except the midrib and nerves) especially when young; main nerves 7 to 9 pairs, ascending, rather straight: length 3·5 to 4·5 in., breadth 1·4 to 1·8 in.; petiole ·45 to ·6 in., rugulose, glaucous. *Panicles* axillary, few-flowered, shorter than the leaves, hoary, the *flowers* on short pedicels. *Sepals* slightly unequal, oblong, obtuse, tomentose on both surfaces. *Ovary* conical, tomentose; the style very short, glabrous; stigma small, 3-lobed. *Fruit* (immature) ovoid-globose, apiculate, minutely tomentose; accrescent sepals membranous, free from the fruit; obscurely 7- to 12-nerved, strongly reticulate, blunt, slightly narrowed to the concave base, at first puberulous but ultimately glabrous; the longer 2·25 in. long, and ·6 to ·75 in. broad, the others smaller.

Penang: Curtis, No. 372. Malacca: Maingay (Kew Distrib.), 212.

In this species the two inner fruiting wings of the calyx are nearly as large as the three outer; the leaves are very white underneath when young, but much less conspicuously so when adult. It is known, only by Curtis' and Maingay's specimens, none of which have complete flowers. Maingay's specimens from Malacca have in fact no flowers; but there is no mistaking their leaves as being exactly like those of Mr. Curtis' from Penang. The vernacular name of this is *Dammar laut dhan lesor*.

15. Shorea ciliata, King, n. sp. A medium-sized tree; young branches slender, dark-coloured, deciduously hoary-puberulous. *Leaves* coriaceous, lanceolate or oblong-lanceolate, acuminate, the base cuneate; both surfaces glabrous, minutely reticulate, the lower whitish when young, pale brown when dry; main nerves 8 or 9 pairs, ascending, curved, shining on the lower surface: length 3 to 3·5 in., breadth ·8 to 1·5 in., petiole ·75 to ·9 in. *Panicles* 2 to 2·5 in. long, axillary and terminal, little-branched, few-flowered, hoary. *Flowers* ·5 in. long, secund. *Sepals* ovoid-deltoid, obtuse, outside tomentose, inside glabrous. *Petals* three times as long as the sepals, narrowly oblong, obtuse, slightly expanded at the base, adpressed-sericeous outside, glabrescent inside. *Stamens* 30, in fascicles of 3, unequal, the shorter with undilated filaments, the longer with filaments dilated in the lower half; all with the connective produced into an apical process crowned by 3 to 5 spreading ciliæ. *Ovary* ovoid-conic, sericeous, with a short glabrous style. *Fruit* (immature) ovoid, apiculate, pale-tomentose, ·5 in. long; accrescent sepals membranous, reticulate: the three outer narrowly oblong, reticulate, 7-nerved: the two inner 2 in. long, and ·3 in. broad, narrowed to above the concave base: the two inner 1 in. long, linear-lanceolate, few-nerved.

Penang: Curtis, No. 1578.

Known only by Curtis' specimens, and readily recognisable by its beautifully ciliate-crested anthers.

16. Shorea utilis, King, n. sp. A large tree; all parts except the inflorescence glabrous: young branches slender, dark-coloured. *Leaves* coriaceous, ovate-lanceolate, caudate-acuminate, or shortly and abruptly acuminate, the base slightly cuneate; main nerves about 7 pairs, oblique, not prominent on either surface; length 2·5 to 3 in., breadth ·9 to 1·2 in., petiole ·4 in. *Panicles* axillary, stellate-puberulous, about as long as the leaves; their lateral branches distant, very short, minutely tomentose, 3- or 4-flowered. *Flowers* sub-sessile, globular in bud, under ·2 in. long. *Sepals* ovate-orbicular, blunt, the outer 3 very tomentose outside, the inner 2 less so; all glabrous inside. *Petals* broadly oblong, blunt, more or less sericeous in both surfaces. *Stamens* 20; filaments slightly dilated, about as long as the ovate anthers; apical process of connective about as long as the anther, ciliate. *Ovary* sericeous, elongated-conic, gradually tapering into the short glabrous style; stigma minute. *Ripe fruit* ovoid, apiculate, pale, adpressed-sericeous, ·4 in. long, closely invested by, but free from, the concave bases of the accrescent sepals. *Sepals of fruiting calyx* all enlarged, membranous, reticulate, deciduously puberulous; the 3 outer oblong, very obtuse, 5-nerved, 1·25 in. long, and ·4 in. broad; the inner 3 half as long, or less, and much narrower.

Penang: Curtis, No. 423.

This species, which Mr. Curtis describes as yielding the most durable timber in Penang, was at one time quite common there, but it is now almost extinct. Its vernacular name is *Dammar laut*.

17. Shorea costata, King, n. sp. A tree; young branches dark-coloured, lepidote-puberulous. *Leaves* thinly coriaceous, oblong, subacute, slightly narrowed to the rounded or sub-cuneate base; both surfaces glabrous, the transverse veins distinct, especially on the lower: main nerves 11 to 13 pairs, oblique, rather straight, slightly prominent beneath; length 3 to 4·25 in., breadth 1·2 to 1·5 in., petiole ·8 to 1 in. *Panicles* axillary and terminal, 1·5 to 2·5 in. long, scaly-puberulous, the lateral branches very short and few-flowered. *Flowers* small. *Sepals* broadly ovate, yellowish-tomentose outside, glabrous inside. *Stamens* 15; all with dilated filaments longer than the ovate anthers, those of the inner row with the apical process of the connective short and glabrous, those of the outer rows with longer ciliate apical connectives. *Ovary* ovoid-conical, densely yellowish-tomentose; style very short. *Ripe fruit* ovoid, apiculate, sparsely puberulous, ·75 in. long; sepals all enlarged, concave and dilated at the base, membranous and reticulate; the three outer narrowly oblong, obtuse, much

narrowed to the base, 7-nerved, 2·75 in. long, and ·45 in. broad; the two inner of the same shape, but few-nerved, only 1·5 in. long, and ·25 in. broad.

Penang: Curtis, No. 199.

A species known only by Mr. Curtis' solitary specimen. The connectives of the inner anthers are ciliate, somewhat in the fashion of *S. ciliata*, King; but the leaves of that species are very different.

18. Shorea stellata, Dyer in Hook. fil. Fl. Br. Ind. I, 304. A tree 100 to 150 feet high; young branches slender, at first stellate-puberulous, but speedily glabrous, with bark dark-coloured and sparsely lenticellate. *Leaves* thinly coriaceous, ovate-lanceolate, the base rounded: upper surfaces glabrous, the lower very minutely lepidote on the reticulations; main nerves 8 to 11 pairs, rather straight, oblique, prominent on the lower surface; length 4 to 5·5 in., breadth 1·75 to 2·25 in., petiole ·7 to ·9 in. *Panicles* axillary or terminal, crowded at the extremities of the branches, many-flowered, 4 to 6 in. long; minutely stellate-pubescent. *Flowers* ·25 in. in diam. *Calyx* minutely greyish-tomentose, the segments ovate-oblong, sub-acute, valvate, erect. *Petals* broadly ovate, obtuse, pubescent outside, spreading. *Stamens* 15, the filaments short, broad; the anthers linear-elongate, shortly bi-mucronate, the connective also shortly mucronate. *Ovary* ovate-globular, grooved, very tomentose; the style short; the stigma ovoid, small. *Ripe fruit* ovoid, apiculate, tomentose, ·5 in. long; sepals all enlarged, sub-equal, membranous, linear-oblong, sub-acute, much narrowed at the base, quite free from the fruit, 5-ribbed, reticulate, 4·5 in. long, and about ·6 in. broad. *Parashorea stellata*, Kurz, Journ. As. Soc., Bengal, for 1870, pt. 2, p. 66. For. Flora Burm., I, 117; Pierre Flore Forest. Coch-Chine, t. 224.

Perak: King's Collector, No. 7505. Distrib. Burmah.

None of the Perak specimens are in fruit; but in leaves and flowers they agree absolutely with Kurz's Burmese specimens. The calyx in all is quite valvate, and it was on this character chiefly that Kurz based the genus *Parashorea*.

19. Shorea Maranti, Burck in Ann. Jard. Bot. Buitenzorg, VI. 217. A small tree: young branches dark-coloured, stellate-puberulous. *Leaves* thinly coriaceous, more or less broadly elliptic or elliptic-oblong, shortly abruptly and bluntly acuminate; the base broad, rounded, or almost truncate; upper surface glabrous, the midrib and nerves minutely tomentose or pubescent when young; lower surface more or less sparsely minutely stellate-puberulous, the sides of the midrib, especially at the axils of the main nerves, glandular and densely covered with masses of brown pale-edged scales: main nerves 12 to 16 pairs, oblique,

slightly curved, thin but prominent beneath when dry, as are the transverse veins; length 3·5 to 6·5 in., breadth 1·5 to 2·25 in.; petiole ·35 in., densely stellate-pubescent, scurfy. *Stipules* deciduous, ovate-lanceolate, nerved, stellate-puberulous. *Panicles* axillary and terminal, few-flowered, tawny-tomentose, (shorter than the leaves [?]); the bracts in pairs, unequal, elliptic-oblong, blunt, nerved, pubescent on both surfaces. "Segments of calyx (fide Burck) unequal, the three outer larger, imbricate. *Petals* minutely tomentose inside. *Stamens* 15, in two rows." *Hopea? Maranti*, Miq. Fl. Ind. Bat. Suppl., 489; A. DC. Prod. XVI, 2, p. 635.

Perak: King's Collector, No. 880. Malacca: Derry, No. 952. Distrib. Sumatra, Bangka.

The Perak specimens are not in flower; and I have seen none from elsewhere that are. The above imperfect description of the flower has therefore been copied from Burck (Ann. Jard. Bot. Buitenzorg, VI. 217). The Perak specimens perfectly agree, as to leaves, with an authentic specimen of Miquel's from Sumatra, in the Calcutta Herbarium. Miquel never saw either flower or fruit. In fact, of the twenty new species of *Dipterocarpeæ* described by this author in the supplement to his Flora of the Netherlands India, the flowers are described in only two, and in these but partially!

20. Shorea eximia, Scheff. in Nat. Tijdschr. Ned. Ind. XXXI, 349. A shrub or small tree; young branches petioles and undersurfaces of leaves stellate-setulose. *Leaves* coriaceous, elliptic-oblong, or ob-lanceolate-oblong, acuminate, narrowed to the rounded or subcuneate base: upper surface glabrous except the tomentose midrib, shining, the nerves depressed: under surface scabrid, pale brown, the reticulations midrib and 17 to 21 pairs of spreading nerves prominent: length 6·5 to 11 in., breadth 2·25 to 3·25 in., petiole ·25 to ·35 in. Stipules in pairs, persistent, ovate, acuminate, longer than the petioles, reticulate, laxly pubescent and warted. "*Wings of fruiting-calyx* linear-lanceolate, obtuse: the three larger narrow at the base, 3·2 to 3·6 in. long, ·5 in. broad, sparsely pubescent, 9-nerved; the two shorter and narrower 1·6 in. long. *Fruit* elongated-ovoid, acuminate, minutely whitish-tomentose." Burck in Ann. Jard. Bot. Buitenzorg VI, 218. *Vatica? eximia*, Miq Fl. Ind. Bat. Suppl. 486; A. DC. Prod. XVI 2, 623. *Vatica sub-lacunosa?* Miq. Fl. Ind. Bat. Suppl. 486. *Shorea sub-lacunosa*, Scheff. in Nat. Tijdschr. Ned. Ind. XXXI, 350: A. DC. Prod. XVI, 2623.

Malacca: Griffith, No. 5018. Penang: King. Perak King's Collector, 10998. Distrib. Sumatra, Bangka.

This plant is very imperfectly known. I have copied the descrip-

tion of the fruit from Dr. Burck (l. c.). Miquel, who first described the plant as a probable *Vatica*, had seen nothing but a leaf-twig. Specimens brought from Perak by the Calcutta collectors bear, instead of flowers, curious cones, 1·5 in. long, of distichous imbricate bracts, concerning which Griffith, in his field note on his specimen No. 5018, wrote,—"irregular growth caused by an insect; each of the scales of these cones bears on its dorsum at its base a number of eggs." Griffith's No. 5019 appears to belong to a closely allied, but distinct, species; as also does the indeterminate plant issued by Wallich as No. 6635 of his catalogue, under the designation, "*Dilleniacea* [*?*] *nervosa*."

21. Shorea Thiseltoni, King, n. sp. A tree 60 to 80 feet high: young branches rather stout, the bark dark-coloured and lenticellate, but covered at first by a pale-grey, deciduous pellicle. *Leaves* coriaceous, elliptic-oblong to elliptic, rarely oblong, sometimes slightly obovate, obtuse, slightly narrowed to the rounded base; both surfaces glabrous, the lower when very young sparsely lepidote, puberulous especially on the midrib and nerves, brown when dry: main nerves 8 or 9 pairs, ascending, slightly curved, bold and prominent on the under surface like the midrib; length 5 to 7 in., breadth 2·5 to 3·25 in.; petiole ·6 to ·8 in., stout. *Panicles* axillary and terminal, 2 to 3 in. long, velvety, few-flowered, apparently ebracteolate. *Flowers* sessile, ·6 or ·7 in. long. *Sepals* ovate, sub-acute, unequal; the 3 outer tomentose outside, glabrous inside; the 2 inner smaller, nearly glabrous, the edges ciliate. *Petals* much longer than the sepals, linear-oblong, obtuse, expanded at the base, glabrous, except one-half of the outer surface which is adpressed-pubescent. *Stamens* 15, in 3 rows, the filaments of all dilated, unequal: the anthers shortly ovate, those of the inner and longer row inappendiculate, those of the other two rows with a short apical appendage from the connective. *Ovary* narrowly conical, tomentose, tapering into the short glabrous style; stigma minute. *Ripe fruit* narrowly ovoid, apiculate, minutely pale-tomentose, substriate, 1·2 in. long, and ·6 in. in diam., the pericarp thick and woody. *Persistant sepals* with much thickened concave woody bases, forming a cup embracing the lower half of the fruit, the apices of the outer three prolonged into membranous linear-oblong obtuse wings exceeding the fruit and sometimes 1·5 in. long; one of the inner sepals shortly winged, the other often broad, obtuse and not winged.

Perak: common. King's Collector.

In this plant the fruit is much larger than in any of the other species of *Shorea* here described, and its pericarp is hard and thick. The bases of the sepals are greatly thickened and concave, and they form a cup which embraces closely, but does not adhere to, the lower

half of the fruit, the apices of some of them being winged as above described. In these respects the species resembles certain other Malayan species of *Shorea*, e. g., *S. Martiniana* Scheff, *S. scaberrima*, and *S. stenoptera*, Burck. Judging from the leaf-specimens on which Miquel founded his *Hopea Singkawang*, that plant must be a close ally of this. A species (flower only) collected by H. O. Forbes in Sumatra (Herb. No. 2952) must also be closely allied to this. It differs however by its conspicuously bracteolate inflorescence. Beccari's Nos. 2681 and 3507, which form the types of Heim's species *S. brachyptera*, are also allied to this.

6. Hopea, Roxb.

Glabrous or hoary-tomentose resinous trees. *Leaves* quite entire, firm, feather-veined; stipules small, deciduous or inconspicuous. *Flowers* sessile or shortly pedicelled, ebracteate, in lax panicles of unilateral racemes. *Sepals* inserted on the receptacle, two being quite external and three for the most part internal, obtuse, imbricate. *Petals* falcate, their apices inflected in bud. *Stamens* 15, or rarely 10, slightly connate; the connective subulate-cuspidate, the anthers ovate, their valves obtuse, equal. *Ovary* 3-celled, the cells 2-ovuled: style shortly cylindric or subulate. *Fruit* 1-seeded, closely surrounded by the bases of the accrescent sepals, the 2 external of which are developed into linear wings, the three internal not longer than the ripe fruit. *Embryo* as in *Shorea*.—Distrib. of *Shorea;* species about 35.

Sect. I. Eu-hopea, Main nerves of leaves bold and prominent.

Nerves of leaves 16 to 18 pairs; accrescent sepals 4 to 4·5 in. long, 10-nerved ... 1 *H. nervosa.*

Nerves of leaves 10 to 13 pairs; accrescent sepals 1·75 to 2·5 in. long, obscurely 5-nerved 2. *H. Curtisii.*

Sect. II. Dryobalanoidea, Miq. Main nerves not distinct.

Petals sericeous: the filaments longer than the anthers; ripe fruit ·3 in. long, the accrescent sepals 7-nerved, 1·75 to 2 in. long, and ·2 to ·25 in. broad; leaf-petioles ·25 to ·4 in. long, minutely tomentose... ... ... 3. *H. micrantha.*

Petals densely sericeous; the filaments shorter than the anthers; ripe fruit ·2 in. long; accrescent sepals obscurely 5- to 7-nerved, 1·25 to 1·5 in. long, and ·25 in. broad; leaf-petioles ·35 to ·6 in. long, slender, puberulous, finally glabrous ... ... 4. *H. intermedia.*

1. Hopea nervosa, King, n. sp. A tree 50 to 70 feet high: young branches dark-coloured, glabrous. *Leaves* coriaceous, oblong to elliptic-oblong, shortly acuminate, the base rounded or very slightly cuneate; both surfaces glabrous; main nerves 16 to 18 pairs, spreading, bold and prominent on the lower; length 3·5 to 5 in., breadth 1·5 to 2·25 in.; petiole ·5 to ·75 in., transversely wrinkled when dry. *Flowers* unknown. *Ripe fruit* ovoid-rotund, apiculate, glabrous, ·5 in. long; the two outer sepals much enlarged, oblong-lanceolate, obtuse, slightly narrowed to the concave thickened smooth base, 10-nerved, 4 to 4·5 in. long, and ·6 to ·75 in. wide; the three inner sepals not quite so long as the fruit, broadly ovate, obtuse, thickened, smooth, closely embracing but not adherent to the fruit.

Perak: King's Collector, No. 3690.

This is a very distinct species, belonging to the group of *Hopea* with the nerves of the leaves bold. It is so distinct that, contrary to my general practice, I venture to name it without having seen the flower.

2. Hopea Curtisii, King, n. sp. A tree 50 to 60 feet high: young branches slender, dark-coloured, lenticellate, almost glabrous. *Leaves* coriaceous, broadly ovate to ovate-oblong, shortly acuminate or acute, the base slightly unequal-sided, rounded, rarely sub-cuneate; both surfaces glabrous, the upper slightly puberulous on the midrib near the base, the lower with several hairy glands at the base, the midrib sparsely and minutely stellate-puberulous; main nerves 10 to 13 pairs, curving, ascending, prominent beneath; length 3·5 to 4·5 in., breadth 1·75 to 2·5 in.; petiole ·4 in., puberulous when young. *Panicles* axillary and terminal, lax, few-flowered. *Flowers* about ·2 in. long, pedicelled. *Sepals* broadly ovate, blunt, concave, tomentose outside, glabrous inside; the inner two rather smaller and more glabrous than the others. *Petals* oblong, oblique, falcate, obtuse, partially tomentose outside, glabrous inside. *Stamens* 10, the filaments short, dilated; anthers ovate, short, the connective with an apical awn longer than the anther. *Ovary* broadly ovate, puberulous at the truncate apex, otherwise glabrous: style short. *Ripe fruit* ovoid, apiculate, pale striate, ·3 in. long; outer two sepals accrescent, narrowly-oblong, reticulate, membranous, obscurely 5-nerved, obtuse, slightly narrowed to the concave smooth base, 1·75 to 2·5 in. long and from ·35 to ·6 in. broad; the three inner non-accrescent sepals about as long as the fruit.

Penang: Curtis No. 1562. Perak: King's Collector, 8161.

3. Hopea micrantha, Hook. fil. in Trans. Linn. Soc., xxiii, 160. A tree 60 to 80 feet high: young branches slender with dark-coloured, lenticellate bark and minute brownish pubescence. *Leaves* coriaceous,

ovate-lanceolate or oblong-lanceolate, bluntly caudate-acuminate; the base slightly cuneate or sometimes broad, rounded and slightly unequal; both surfaces glabrous except the pubescent midrib: main nerves numerous, not much more prominent than the secondary, and both indistinct; length 2 to 4 in., breadth ·8 to 1·75 in.; petiole ·25 to ·4 in. minutely tomentose. *Panicles* axillary and terminal, numerous, short, spreading, 1 to 1·5 in. long, puberulous or glabrous. *Flowers* ·15 to ·25 in. long, shortly pedicellate. *Sepals* sub-equal, ovate-rotund, subacute or obtuse, puberulous and resinous outside, glabrous inside. *Petals* twice as long as the sepals, broadly oblong-obtuse, silky outside except on one side, glabrous inside. *Stamens* about 12, the filaments dilated in the lower half, longer than the ovate anthers; the connective produced into a single apical awn longer than the stamen. *Ovary* elongated, often constricted in the middle, glabrous; style very short, stigma minute. *Ripe fruit* ovoid, apiculate, ·3 in. long, striate, closely embraced by the 3 inner sepals which about equal it in length; the outer two sepals accrescent, oblanceolate, obtuse, tapering to the concave base, reticulate, 7-nerved, 1·75 to 2 in. long, and ·2 to ·25 in. broad. A. DC. Prod. XVI. 2, p. 634. Dyer in Hook. fil. Fl. Br. Ind. I, 310. Burck in Ann. Bot. Jard. Buitenzorg, VI, 238.

Malacca; Maingay (Kew Distrib.) No. 210. Penang: Curtis, Nos. 167, 266, 1397. Perak: King's Collector, Nos. 3525, 8170. Distrib. Borneo: Bangka, Sumatra.

Mr. Curtis notes on the Penang specimens of this, that the bark of the tree is smooth and of a grey colour, whereas the back of its close ally *H. intermedia* is fissured like that of *Shorea parviflora*. The species of *Hopea* with numerous indistinct nerves, (Sect. *Dryobalanoides*) are not easy to distinguish from each other in the Herbarium. *H. Mengarawan*, Miq., a species published two years earlier than this (*i. e.*, in 1860), comes very near this, and the two may possibly prove to be identical, in which case Miquel's name must be adopted. *Hopea cernua*, Teysm. and Binn. was described by its authors from a plant originally obtained from Sumatra, but cultivated in the Buitenzorg Garden. It differs from *H. Mengarawan* and from *H. micrantha* in having larger leaves with more prominent nerves. Its authors were doubtful as to its being really distinct from *H. Mengarawan*, and I think these doubts were well founded. Under the species named *H. Dryobalanoides* by Miquel (l. c) there are, Dr. Burck asserts, two plants. One of these collected at Soengiepagoe in Sumatra, is, he says, simply *H. Mengarawan*, Miq., and it is the fruit of this which Miquel describes under his *H. Dryobalanoides*. The other specimen from Priaman in Sumatra is different, and it is to it that Dr. Burck (Ann. Bot. Jard. Buitenzorg VI., 241) desires to

restrict the name *H. Dryobalanoides*, Miq. There is in the Calcutta Herbarium an authentic specimen of the very gathering of the Soengie-pagoe plant on which Miquel worked, and I should refer it to *H. micrantha* Hook. fil.

Petalandra micrantha, Harssk. has been reduced by the authors of the Genera Plantarum (Vol. I. p. 193) to *Hopea*. It is however a different plant from this, and belongs to Miquel's section *Eu-hopea*, which is characterised by the nerves being prominent. By Dr. Burck, *Petalandra* is reduced to *Doona*.

4. Hopea intermedia, King n. sp. A tree 60 to 80 feet high: young branches rather dark-coloured, minutely lenticellate, puberulous. *Leaves* coriaceous, ovate-lanceolate, caudate-acuminate, the base cuneate, both surfaces glabrous; main nerves numerous, faint; length 2·5 to 3 in., breadth 1 to 1·35 in.; petiole ·35 to ·6 in. slender, puberulous but finally glabrous. *Panicles* as in *H. Mengarawan*, the flowers pedicellate. *Sepals* sub-equal; the two outer ovate, acuminate; the three inner broader and more obtuse, all resinous outside, glabrous and smooth inside. *Petals* twice as long as the sepals, narrowly oblong, obtuse, falcate, densely sericeous externally, glabrous within. *Stamens* 12; the filaments dilated, shorter than the anthers; the anthers short, crowned by a straight awn from the connective longer than the stamen. *Ovary* hour-glass shaped; style short, stigma small. *Ripe fruit* ovoid, apiculate, ·2 in. long, pale, striate; the two outer sepals accrescent, narrowly oblong-obtuse, narrowed to the base, reticulate, obscurely 5- to 7-nerved, 1·25 to 1·5 in. long and ·25 in. broad; the inner three sepals not accrescent, not longer than the fruit, and closely embracing it.

Penang: Curtis, No. 425 and 1398. Perak: King's Collector, No. 3709.

This species is no doubt near to *H. micrantha*, Hook. fil., but, according to Mr. Curtis, it is distinguishable from that, while growing, by its bark, this tree having a fissured bark like that of *Shorea parvifolia*, Dyer, while the bark of *H. micrantha* is smooth and grey. The petals of this are also more sericeous than those of *H. micrantha*, the filaments are shorter than the anthers (not longer, as in *H. micrantha*), the leaves are more glabrous, the petioles longer and more slender and more glabrous, and the fruit and accrescent sepals are smaller than in *H. micrantha*. I have therefore ventured, after much hesitation, to name this as a species, and from its relationship to *H. micrantha* and *H. Menyarawun*, I have called it *H. intermedia*. Its vernacular name in Penang is *Jankang*. It has been suggested that this plant should be referred to *H. Dryobalanoides*, Miq.—a course which I would have adopted with great pleasure had it been clear what *H. Dryobalanoides* really is.

But, as I have stated in a note under *H. micrantha*, *H. Dryobalanoides* appears to be a composite species; moreover, its author nowhere describes its flowers. For these reasons I think it ought to be suppressed as a species.

7. Retinodendron, Korthals.

Resinous trees, with the leaves, inflorescence, and flowers of *Vatica*. *Ripe fruit* globular, crowned by the persistent style, 1-celled, 1-seeded, the pericarp coriaceous, indehiscent. *Calyx* of ripe fruit slightly accrescent, the pieces oblong, nearly equal, and quite free from, and usually shorter than, the fruit (longer in *R. Kunstleri*). *Isauxis* (sub-genus of *Vateria*) W and A. Distrib. Malaya and British India. Species about 10.

Isauxis was established by Wight and Arnot as a sub-genus of *Vateria*, Linn. to receive the three species *Vateria lanceæfolia*, Roxb., *V. Roxburghiana*, Wight and *V. Ceylonica*, Wight (*Stemoporus Wightii*, Thw.) and its characters were, "Segments of the calyx ovate, acute, enlarging in fruit; petals falcate and about three times the length of the calyx: *stamens* 15 with oblong anther cells; *style* short; *stigma* clavate, 3–6 toothed: *panicles* axillary, shorter than the leaves." The other section of *Vateria* suggested by Wight was *Eu-Vateria* (the *Vateria* of Linnæus and of which *V. indica*, L. is the type) and of this the characters are, "*Calyx-segments* obtuse, scarcely enlarging in fruit: *petals* oval, scarcely longer than the calyx: *stamens* 40 or 50 with linear anther-cells: *style* elongated: *stigma* acute; *panicle* large and terminal. Korthals, evidently overlooking Wight's Illustrations, published (Verh. Nat. Gesch. Ned. Ind. p. 56) his genus *Retinodendron* to cover one of the very plants (*viz.*, *Vateria lanceæfolia*, Roxb.) for which Wight and Arnot founded the sub-genus *Isauxis*; and to this *Retinodendron* Korthals added his own Malayan species *R. Rassak* and *R. pauciflorum*. Although *Isauxis* may have the priority as a sub-genus (Wight's Illustrations were published in 1840, and Korthals' book, just quoted, bears the date 1839—1842), *Retinodendron* takes precedence as a *genus*. The flowers of *Retinodendron* are exactly those of all the species of *Vatica* (except the anomalous *V. scaphula*, Roxb.) inasmuch as the segments of the calyx are slightly imbricate when the bud is very young, becoming valvate as the bud advances in age; the petals are much longer than broad, their apices are not inflexed in æstivation, and they are not spreading when expanded. The fruit itself is also practically that of *Vatica*; but the fruiting-calyx is different, for its lobes are invariably free from the beginning, they are pretty nearly equal to each other, but (although slightly accrescent) they are in most cases *shorter* than the fruit. As regards its calyx, *Retinodendron* is closely allied to *Vateria*, but it differs from *Vateria* in its flowers; for in *Vateria* the stamens are numerous (40 to 50), the petals are scarcely longer than the segments of the calyx and are spreading; moreover the inflorescence is longer in *Vateria* than in *Retinodendron*, and it is terminal. In short, *Retinodendron* has the flowers of *Vatica* and the fruit of *Vateria*. Dr. Burck forms *Retinodendron* and *Isauxis* into sections of the genus *Vatica*, giving however characters to the section *Isauxis* which form no part of Wight's original characters of it as a sub-section of *Vateria*. In Dr. Burck's section *Isauxis*, "the calyx-lobes are all accrescent, sub-equal to the fruit, or much longer."

Fruiting-calyx shorter than the fruit.

Leaves 3·5 to 6 in. long: fruit ·4 in. in diam. 1. *R. pallidum.*

Leaves 7 to 10 in. long: fruit ·65 in. in diam. 2. *R. Scortechinii.*

Fruiting-calyx longer than the fruit ... 3. *R. Kunstleri.*

1. Retinodendron pallidium, King. A small tree (fide Dyer): young branches slender, deciduously puberulous, their bark pale. *Leaves* coriaceous, oblong-lanceolate to narrowly elliptic, acuminate; the edges entire, recurved when dry; the base acute: both surfaces glabrous, the upper shining; main nerves 9 to 10 pairs, curving, oblique; length 3·5 to 6 in., breadth 1·2 to 1·8 in., petiole ·4 to ·5 in. *Panicles* axillary, rarely extra-axillary, puberulous, 1 to 3 in. long. *Flowers* ·45 in. long; *Calyx-segments* ovate-lanceolate, scurfy-pubescent. *Petals* oblong, lanceolate, sub-acute, stellate-pubescent externally. *Anthers* broadly ovate, with a short blunt apiculus. *Ovary* puberulous; stigma capitate, lobed. *Fruit* globular, about ·4 in. in diam., glabrous, shining, very minutely and sparsely lepidote, partially covered in the lower half by the slightly unequal, spreading or sub-reflexed, narrowly-oblong, membranous, 3-nerved, reticulate calyx-lobes. *Vatica pallida*, Dyer in Hook. fil. Fl. Br. Ind. I, 302.

Penang: Maingay, on Government Hill, at an elevation of about 800 feet; Curtis, No. 117; King, Kunstler.

This is known only from Penang. It is evidently a rare tree. Its fruit somewhat resembles (except in size) that of *V. lanceæfolia*, Blume.

2. Retinodendron Scortechinii, King, n. sp. A tall tree: young branches rather stout, densely furfuraceous-pubescent. *Leaves* coriaceous, oblong, tapering to the sub-acute apex; the base slightly narrowed, rounded: both surfaces glabrous: main nerves 14 to 18 pairs, spreading, curving, prominent on the lower, depressed on the upper, surface when dry, the transverse venation bold: length 7 to 10 in., breadth 2·6 to 3·2 in., petiole ·6 to ·75 in. *Panicles* crowded towards the apices of the branches, mostly axillary, 2 to 2·5 in. long, the rachises brownish flocculent stellate-tomentose, as is the calyx externally. *Flowers* ·6 in. long. *Calyx-lobes* ovate. *Petals* thick, oblong, blunt, puberulous externally, glabrous within. *Stamens* elliptic, apiculate. *Ovary* minutely tomentose; stigma clavate. *Ripe fruit* subglobular, sub-rugose, vertically grooved, minutely rufous-scurfy, about ·65 in. in diam., laxly embraced in the lower half by the broadly ovate, membranous, many-nerved, reticulate, sub-equal calyx-lobes.

Perak: Scortechini, Nos. 1940 and 1942.

The calyx-lobes are nearly equal in size, quite free from the fruit, much shorter, and they embrace only its lower half. This species is allied to *Retinodendron Rassak*, Korth. (Nat. Gesch. Ned. Ind. 56, t. 8,)

but has broader leaves and much more condensed panicles than that species.

3. Retinodendron Kunstleri, King n. sp. A tree, 20 to 50 feet high, sometimes a shrub: young branches slender, deciduously stellate-puberulous. *Leaves* thinly coriaceous, elliptic-oblong to oblong-lanceolate, sometimes slightly obovate, sub-acute or shortly and bluntly acuminate; the base cuneate, rarely rounded: upper surface glabrous, the midrib and nerves pubescent; the lower quite glabrous; main nerves 7 to 9 pairs, ascending, slightly prominent beneath: length 2·25 to 4·5 in., breadth 1·25 to 1·75 in., petiole ·25 to ·4 in. *Racemes* axillary, 1 to 1·5 in. long, sparsely scaly. *Flowers* ·4 in. long. *Calyx-lobes* ovate-lanceolate, puberulous. *Petals* oblong-elliptic, oblique, obtuse, puberulous outside. *Anthers* slightly and sharply apiculate. *Ovary* puberulous, stigma capitate. *Ripe fruit* globular, with a long curved apical beak, glabrous, about ·25 in. in diam. *Calyx-lobes* all accrescent, sub-equal, oblong, tapering slightly to the sub-obtuse apex, the base slightly auricled, thickly membranous, glabrous, 3-nerved, the longest about 1·3 in. long, and ·35 in. broad, loosely surrounding, and longer than, the fruit.

Perak; Scortechini, Wray, King's Collector; very common at low elevations.

In this species all the five calyx-lobes are accrescent and of nearly equal size. They are quite free from the ripe fruit, round which they form a loose semi-inflated investiture. Its nearest ally is *Vatica bancana*, Scheffer, (*Retinodendron bancanum*).

8. Isoptera, Scheffer.

A tall resinous tree. *Leaves* coriaceous, entire, feather-veined. *Flowers* in axillary or terminal panicles. *Calyx-tube* very short, the segments ovate-rotund, imbricate. *Stamens* 30 to 35, the anthers ovate, the cells divergent at the base, acute, the valves equal, the connective produced into an apical bristle-like appendage. *Ovary* 3-celled, the loculi bi-ovulate; the style short, terete, 3-angled at the apex. *Fruit* indehiscent, 1-seeded, the pericarp coriaceous. *Fruiting-calyx* an open cup not embracing the fruit; its lobes all slightly enlarged, spreading (not winged); the outer 3 rotund, broader than the 2 narrower inner lobes.

One species—Malayan.

1. Isoptera Borneensis, Scheff. MSS. ex Burck in Ann. Bot. Jard. Buitenzorg VI, 222. A large tree: young branches slender, dark-coloured, sparsely lenticellate, glabrescent. *Leaves* coriaceous, oblong, sub-acute, slightly narrowed to the rounded base: upper surface glabrous except the puberulous midrib; the lower pale, glabrous; main

nerves 8 or 9 pairs, oblique, slightly curving, prominent beneath; length 4 to 5 in., breadth 1·75 to 2 in., petiole ·5 in. *Panicles* 4 to 6 in. long, stellate-pubescent; bracteoles caducous. *Flowers* shortly stalked. *Calyx-segments* minutely tomentose. *Petals* ·5 in. long, pale tomentose. *Stamens* 30 to 36, in 3 series, the filaments dilated at the base: anthers with equal valves. *Ovary* sericeous, style glabrous. *Ripe fruit* sub-globose, acuminate, pale tomentose, about ·25 in. in diam.; fruiting-calyx forming a cup with a concave short tube embracing the fruit, the segments spreading, re-curved, the 3 outer ·65 in. in length and breadth, the 2 inner smaller. Heim, "Recherches sur les Dipterocarpacées," p. 51.

Pahang: Ridley, No. 2626. Distrib. Bangka, Borneo.

Leaf-specimens of what appear to be this tree were collected by Mr. Wray (Herb. No. 3426) in Upper Perak.

9. Balanocarpus, Beddome.

Glabrous or puberulous, rarely scabrid, resinous trees, with inconspicuous fugaceous stipules. *Leaves* entire, coriaceous or membranous, penni-nerved. *Flowers* secund, sessile or shortly pedicelled. *Sepals* distinct or united at the base, imbricated, two quite external to the others; in fruit sub-equal, only slightly enlarged, woody, thickened, and forming a 5-lobed cup round the base of (but rarely enveloping) the fruit, not adnate to it and never expanding into wings. *Petals* elliptic, obliquely acuminate, the apices slightly inflexed in bud or not inflexed at all. *Stamens* 15, attached to the bases of the petals, in 3 rows; or 10 in 2 rows, sub-equal, the filaments much dilated at the base, the connective prolonged into a straight apical awn longer than the ovate anther. *Torus* flat. *Ovary* 3-celled, cells 2-ovuled, ovules collateral. *Style* short. *Stigma* minute, entire. *Fruit* oblong or sub-globose, apiculate; the pericarp ligneous or sub-ligneous. *Seed* solitary, erect; cotyledons fleshy, plano-concave, the larger 2- or 3-lobed, or entire; the radicle prominent. Southern Peninsular India, Malaya. Probably 12 species.

Leaves glabrous, smooth.
  Leaves ovate-lanceolate or ovate, caudate-acuminate.
    Stamens 15
      Fruit entirely enveloped in the slightly enlarged calyx ... ... 1. *B. Curtisii.*
      Only the lower part of the fruit enveloped by the calyx ... ... 2. *B. penangianus.*
    Stamens 10 ... ... 3. *B. anomalus.*

Leaves narrowly oblong, gradually narrowed to the acute apex.
- Fruit 1·75 to 2·25 in. long: stamens 10 ... 4. *B. maximus.*
- Fruit 1·5 in. long; leaves 4 to 6 in. long, with 9 or 10 pairs of bold parallel nerves ... ... 5. *B. Heimii.*
- Fruit ·6 in. long: leaves 2·25 to 2·75 in. long, with 7 or 8 pairs of slightly prominent nerves ... ... 6. *B. Wrayi.*

Leaves stellate-pubescent, scabrid ... ... 7. *B. Hemsleyanus.*

1. Balanocarpus Curtisii, King. A tree 20 to 30 feet high: young branches slender, the bark dark-coloured, puberulous. *Leaves* membranous, ovate-lanceolate, bluntly caudate-acuminate, the base slightly cuneate: both surfaces glabrous, dull; main nerves 8 to 10 pairs, spreading, faint and scarcely more prominent than the secondary nerves; length 2 to 2·5 in., breadth ·75 to 1 in., petiole ·1 to ·15 in. *Panicles* axillary and terminal, shorter than the leaves, glabrescent, lax, each with a few 3- to 5-flowered spreading branches. *Flowers* secund, shortly pedicelled, ·15 in. long. *Sepals* distinct, sub-equal, thick, rotund-ovate, very obtuse, puberulous outside, glabrous inside, the edges slightly ciliate. *Petals* elliptic, obliquely shortly and bluntly acuminate, glabrescent inside, partly puberulous and partly glabrous outside. *Stamens* 15, in 3 rows, sub-equal; the filaments shorter than the anthers, dilated: anthers broadly elliptic, truncate, the connective produced into an apical awn longer than the stamen. *Ovary* cylindric, truncate, glabrous, the style short and stigma minute. *Fruit* smooth, globular, apiculate, crowned by the sub-sessile discoid stigma, enveloped by, but not adherent to, the slightly thickened sepals, ·25 to ·3 in. in diam. (calyx included).

Penang: Curtis, No. 1406. Perak: King's Collector, Nos. 3171, 3294, 6543; Wray, No. 2860.

2. Balanocarpus penangianus, King, n. sp. A tree 40 to 50 feet high: young branches slender, dark-coloured, lenticellate, slightly puberulous at the very tips. *Leaves* coriaceous, ovate-lanceolate or ovate-acuminate, often caudate-acuminate, the base slightly cuneate or almost rounded, the edges slightly undulate, both surfaces glabrous: main nerves 7 to 8 pairs, spreading and curving upwards, not prominent on either surface; length 1·75 to 4 in., breadth ·8 to 1·6 in., petiole ·25 to ·4 in. *Panicles* axillary and terminal, hoary-pubescent, many-flowered; the flowers secund, 7 to 9 on each lateral branchlet, pedicelled, ·15 to ·2 in. long. *Sepals* sub-equal, broadly ovate, sub-acute, yellowish-pulverulent, tomentose externally, glabrous internally. *Petals* oblong, obtuse, twisted and with the apices reflexed in æstivation, spreading

when expanded, minutely yellowish-pulverulent, tomentose outside, glabrous inside. *Stamens* 15, sub-equal: apical awn curved, longer than the anther. *Ovary* ovoid, narrowing upwards into the style; stigma minute. *Fruit* ovoid, very slightly apiculate, striate, pale pubescent, about ·6 in. long and ·3 in. in diam., the persistent calyx covering the lower third of the fruit, sub-glabrous, thickened and concave at the base; the teeth deltoid, spreading. *Richetia penangiana*, Heim in Bull. Soc. Linn. Paris, 1891, p. 980.

Penang: on Government Hill, at an elevation of about 1,000 feet, Curtis, Nos. 1429 and 1393; Hullett, No. 188; King's Collector, No. 1534. Perak: King's Collector, Nos. 3333, 3707.

The leaves of this species, although larger, resemble those of *B. Curtisii*: but the fruits of the two are quite different. One of Mr. Curtis' specimens, No. 429 (communicated from Kew), forms the type of a new genus called *Richetia*, which M. Heim has founded (l. c. p., 975, also in his "Recherches sur les Dipterocarpacées" p. 50), without having seen its flowers. I have retained for this M. Heim's specific name, while referring it to Beddome's older genus. The vernacular name of the species is *Dammar Etam.*

3. Balanocarpus anomalus, King. A tree: young branches slender, dark-coloured, minutely lenticellate, the tips puberulous. *Leaves* coriaceous, ovate, acuminate; the base broad, sub-cuneate; both surfaces glabrous; main nerves 6 or 7 pairs, ascending, curving, not prominent: length 2·25 to 2·5 in., breadth 1 to 1·3 in., petiole ·6 to ·7 in. *Panicles* numerous, axillary and terminal, longer than the leaves, pubescent, their lateral branchlets bearing 6 to 8 sub-secund flowers. *Flowers* shortly pedicelled, ·15 in. long. *Sepals* broadly ovate, connate at the base, obtuse, minutely tomentose outside, glabrous inside. *Petals* elliptic, blunt, yellowish adpressed-sericeous outside, glabrous inside, only about twice as long as the sepals, spreading and reflexed so as to expose the stamens and pistil. *Stamens* 10, in two rows; the filaments longer than the anthers, dilated; anther short, ovate, its connective produced into an apical awn as long as itself. *Ovary* ovoid, striate, pubescent, style short and thick, stigma small.

Kedah: Curtis, No. 1654.

Mr. Curtis is as yet the only collector of this, and his specimens have no fruit. I refer it to this genus, although its flowers differ from those of the other species known to me, in having petals only about twice as long as the sepals, spreading and reflexed so that the androgynœcium is quite exposed; and in having only 10 stamens. In other respects the specimens agree with *Balanocarpus.* Its vernacular name in Kedah is *Malaut.*

4. Balanocarpus maximus, King, n. sp. A tree 60 to 80 feet high: all parts except the inflorescence glabrous: young branches rather stout; the bark, loose, papery, lenticellate, pale. *Leaves* thinly coriaceous, oblong to elliptic-oblong, sub-acute, slightly narrowed to the rounded base; main nerves 7 to 9 pairs, slightly prominent beneath, the transverse veins slightly prominent when dry: length 5 to 7 in., breadth 2 to 2·5 in., petiole ·5 to ·6 in. *Panicles* axillary or terminal, about half as long as the leaves, few-flowered, minutely tomentose. *Flowers* subsessile, ·6 or ·7 in. long. *Sepals* broadly ovate, the outer two tomentose, the inner three more or less glabrous externally, all glabrous internally, the inner two with ciliate margins. *Petals* much longer than the sepals, narrowly oblong, the apex erose, expanded and concave at the base, adpressed-pubescent outside and towards the apex inside, otherwise glabrous. *Stamens* 10, in two rows; anthers with a deflexed terminal appendage from the connective. *Ovary* elongate, narrowly conical, sericeous. *Style* rather short, glabrous; stigma small. *Ripe fruit* cylindrical, tapering to each end but most to the apiculate apex; pericarp woody, striate, sub-glabrous, pale-brown when dry: 1·75 to 2·25 in. long, and ·6 or ·7 in. in diam. *Persistent sepals* fibrous, forming a toothed cup about ·5 in. deep, embracing the base of the fruit.

Perak: King's Collector, Nos. 7987 and 8006.

The flowers of this fine species do not exactly answer to Beddome's diagnosis of the genus *Balanocarpus*, inasmuch as they have 10 instead of 15 stamens, and neither of the cotyledons is lobed. In other respects the flowers and fruit agree perfectly.

5. Balanocarpus Heimii, King n. sp. A tree 50 to 60 feet high: young branches rather slender, the bark dark-coloured, puberulous or glabrescent. *Leaves* coriaceous, narrowly oblong, tapering to the acuminate apex, and slightly narrowed to the rounded base; upper surface glabrous, shining, the midrib minutely pubescent: lower surface glabrescent except the pubescent midrib and 9 or 10 pairs of ascending, bold, slightly-curving nerves: length 4 to 6 in., breadth 1 to 1·75 in.; petiole ·3 or ·4 in., with minute black tomentum. *Flowers* unknown. *Ripe carpels* cylindric, tapering to the apex, slightly narrowed to the base, 1·5 in. long and ·5 in. in diam.; the pericarp woody, sub-glabrous, sub-striate, dark-coloured when dry. *Persistent sepals* sub-equal, puberulous, thickened, forming a 5-lobed cup ·6 in. deep which embraces the base of the fruit. *Pierrea Penangiana*, Heim, MSS.

Penang: Curtis No. 273 (leaves only). Perak: King's Collector, No. 3718.

This tree, of which as yet only fruiting specimens have been found, so closely resembles the other Malayan species of *Balanocarpus* des-

cribed here, that I refer it without any hesitation to this genus. M. Curtis' leaf specimens of this have, I understand, received from M. Heim the MSS. name, *Pierrea penangiana*. The genus *Pierrea* has been founded by M. Heim (Bull. Soc. Linn. Paris, 1891, p. 958, and "Recherches sur les Dipterocarpacées", p. 78) on specimens of which the author has not (as he admits) had the advantage of seeing the flowers. The vernacular name of this tree in Penang is *Chengah*, and its timber is, according to Mr. Curtis, very valuable. In the State of Perak, on the mainland almost opposite Penang, another species (*B. Wrayi*) receives a similar vernacular name.

6. Balanocarpus Wrayi, King n. sp. A tree: young branches slender, dark-coloured, glabrous. *Leaves* coriaceous, narrowly oblong, gradually tapering from the middle to the acute apex; the base sub-cuneate or rounded, slightly unequal-sided: both surfaces glabrous; main nerves 7 or 8 pairs, curved, oblique, slightly prominent beneath: length 2·25 to 2·75 in., breadth ·75 in.; petiole ·25 in., transversely wrinkled. *Panicles* axillary and terminal, nearly as long as the leaves. *Flowers* unknown. *Fruit* ovoid, much apiculate, glabrous, ·6 in. long, covered in its lower two-thirds by the persistent sub-accrescent glabrous calyx; outer two sepals smaller than the others, elliptic, obtuse, the inner three rotund, all thickened and concave.

Perak: Wray, No. 813.

Collected only once and without flowers. According to Mr. Wray the timber of this tree is valuable, and its vernacular name is *Chingi*, or *Chingal*. I refer this (in spite of the absence of flowers) to *Balanocarpus*, the other species of which it so closely resembles.

7. Balanocarpus Hemsleyanus, King, n. sp. A tree 50 to 100 feet high: young branches rather stout, rough, minutely lenticellate, puberulous. *Leaves* coriaceous, elliptic-oblong, sometimes slightly obovate, shortly and abruptly acuminate, slightly narrowed to the rounded or sub-emarginate base: upper surface glabrous except the minutely tomentose midrib; the lower scabrid from minute rigid stellately hairy tubercles which are most abundant on the stout midrib and nerves: main nerves 18 to 20 pairs, oblique, parallel, very prominent on the lower, obsolete on the upper, surface; length 7 to 12 in., breadth 3·25 to 5 in.; petiole ·6 to ·9 in. scabrid, pubescent. *Panicles* axillary or terminal, 3 to 7 in. long, scurfy stellate-pubescent; flowers rather crowded on the lateral branchlets, ·5 in. long, *Sepals* sub-equal, broadly ovate, acute, yellowish-tomentose externally, glabrous internally. *Petals* twice as long as the sepals, or longer, elliptic, oblique, obtuse, glabrous except a broad adpressed-sericeous band externally. *Stamens* 15, in three rows: the filaments dilated, unequal, longer than

the shortly ovate anthers; apical connectival appendage deflexed, curved, longer than the anther. *Ovary* elongated-conic, tomentose, tapering into the sparsely puberulous style; stigma small. *Ripe fruit* narrowly ovoid, apiculate, pale brownish-tomentose, 1·25 to 1·5 in. long. and ·75 to 1 in. in diam. *Persistent sepals* nearly equal, their bases thickened, woody, pubescent, and concave, forming an irregularly 5-toothed cup which embraces the lower half of the fruit. *Shorea Hemsleyana*, King MSS. in Herb. Calc.

Penang: Curtis No. 2512. Perak: King's Collector, Nos. 5431, 6670, and 7562. Scortechini No. 1653.

This is an altogether anomalous species. It has leaves like several of the scabrid species of *Shorea*, such as *S. eximia* and *S. leprosula*. Its flowers are also more like those of *Shorea* than *Balanocarpus;* but its fruit is essentially that of the latter genus, in which, not without hesitation, I include it.

10. Pachynocarpus, Hook. fil.

Resinous trees with the leaves and flowers of *Vatica*, but with sometimes only ten stamens. *Fruit* ovoid-globose, umbonate at the apex, 1-celled, 1-seeded, the pericarp densely coriaceous, splitting vertically. *Calyx* with five equal segments, at first almost free from the fruit, but the tube gradually accrescent, much thickened and adnate to the fruit, and finally embracing the whole of it except the apex. *Seed* pendulous, testa thin and adherent to the endocarp, cotyledons very thick and fleshy.

Leaves elliptic to oblong-elliptic, sub-acute or shortly and obtusely acuminate... ... 1. *P. Wallichii.*

Leaves broadly-elliptic or obovate-elliptic, the apex very blunt ... ... 2. *P. Stapfianus.*

Dr. Burck (in Ann. Jard. Bot. Buitenzorg) expands the definition of the genus *Vatica* so as to include not only the closely allied *Synaptea*, but also the genera *Isauxis* W. A., *Retinodendron*, Korth., and *Pachynocarpus* Hook fil. To the union of *Synaptea* with *Vatica* I see no objection; for the whole difference between the two (as I have stated in a note under *Vatica*) consists in perfect freedom of the fruit in *Vatica* from the enlarged calyx, whereas in *Synaptea* there is a slight adhesion to the calyx at the very base. But for the inclusion of *Pachynocarpus*, I see no sufficient justification; for in this genus the calyx does not expand into membranous wings, but forms a dense fibro-cartilaginous cover for the fruit, which it tightly embraces, and to which it is quite adnate. As regards *Isauxis* and *Retinodendron*, they appear to me to be undistinguishable from each other by any but trivial marks, but they differ sufficiently in calyx from *Vatica* to be treated as a genus under the older name *Retinodendron*.

1. Pachynocarpus Wallichii, King. A tree 40 to 70 feet high: young branches deciduously scurfy-puberulous, their bark pale-brown, sparsely lenticellate. *Leaves* coriaceous, elliptic to oblong-elliptic,

sub-acute, or shortly and obtusely acuminate, the base cuneate; both surfaces glabrous, the lower pale and prominently reticulate when dry: main nerves 6 to 9 pairs, slightly prominent beneath, ascending; length 4·5 to 8 in., breadth 1·5 to 3 in., petiole; ·4 to ·6 in. *Panicles* crowded near the apices of the branches, many-flowered, 2 to 4 in. long. *Calyx-lobes* deltoid, minutely velvety outside. *Petals* linear-oblong, obtuse, puberulous externally. *Stamens* broadly ovoid, minutely but obtusely apiculate. *Ovary* puberulous: stigma sub-capitate, lobed. *Ripe fruit* ovoid-globose, about ·75 in. in diam., closely embraced by the slightly shorter, much thickened, persistent, fibrous or woody, rugose, enlarged calyx-lobes. *V. Wallichii* Dyer in Journ. Bot. 1878 p. 154. *Vatica ruminata*, Burck in Ann. Jard. Bot Buitenzorg, VI, 227 t. 29, fig. 4.

Penang: Wallich, Cat. No. 9018; Curtis Nos. 1161, 1218, 1391. Malacca: Maingay No. 201. Trang, King's Collector. Johore, Hullett and King. Perak: common at low elevations, King's Collector, Scortechini. Distrib., Bangka.

In the young stages of the fruit of this species the calyx is quite small and embraces only the very base of it, much as in *Isauxis;* but as the fruit expands the calyx grows, so that when ripe the fruit is, with the exception of its apex, closely embraced by the much thickened, lignified, obscurely toothed calyx-tube. This offers, therefore, a transition between *Isauxis* and *Pachynocarpus.* And, indeed, it is to the former section that Dyer refers it (Journ. Bot., l. c.), and to which Burck refers his *D. ruminata*, a species which authentic specimens shew to be identical with this. Dr. Burck's species, *Vatica verrucosa* (Ann. Jard. Bot. Buitenzorg) appears also to come very near to this.

2. Pachynocarpus Stapfianus, King, n. sp. A tree 80 to 100 feet high: young branches rather stout, scaly-pubescent at first, ultimately glabrous. *Leaves* coriaceous, broadly elliptic or obovate-elliptic, the apex broadly rounded, slightly narrowed to the rounded or sub-cuneate base: upper surface glabrous, shining, the lower paler, minutely and sparsely scurfy-puberulous on the midrib and nerves; main nerves 10 to 13 pairs, oblique, prominent on the lower, depressed on the upper, surface; length 5 to 8 in., breadth 2·75 to 4·5 in., petiole ·65 to 1 in. *Flowers* unknown. *Ripe fruit* almost solitary, 2·5 to 3 in. long, on a woody raceme, globular, slightly apiculate, 1·25 in diam., closely invested by the gamosepalous, 5-toothed, thickened, woody, rugose, glaberulous calyx.

Perak: King's Collector, Nos. 5932 and 6132,

This very distinct species was first recognised as a *Pachynocarpus* by Dr. O. Stapf, of the Kew Herbarium, after whom I have named it. Its flowers are as yet unknown; but it is readily identified by its leaves.

11. Ancistrocladus, Wall.

Smooth climbing shrubs with short supra-axillary, often arrested and circinately-hooked, branches. *Leaves* usually in terminal tufts, coriaceous, entire, reticulately feather-veined; exstipulate. *Flowers* usually small, very caducous, in terminal or lateral panicles. *Calyx-tube* at first short, adnate to the base of the ovary, its lobes imbricate, finally turbinate and adnate to the fruit, with the lobes unequally enlarged, spreading and membranous. *Stamens* 5 or 10, subperigynous. *Ovary* 1-celled, inferior; style sub-globose, persistent; *Stigmas* 3, erect, compressed, truncate, deciduous. Ovule solitary, erect or laterally affixed. *Seed* sub-globose, testa prolonged into the ruminations of the copious fleshy albumen; embryo short, straight; cotyledons short, divergent.—Distrib. Except *A. guineensis* in W. Tropical Africa, confined to Tropical Asia and the Indian Archipelago. Species about 10.

I follow the authors of the Genera Plantarum and the Flora of British India in including *Ancistrocladus* in *Dipterocarpeæ*. I venture, however, to think that it would be better to keep it as the type of a distinct Natural Order as MM. Planchon and De Candolle have done: for its characters do not fit well into the diagnosis of any other Order.

1. Ancistrocladus extensus, Wall. Cat. 1052. *Leaves* obovate or obovate-oblong, blunt or sub-acute, much narrowed at the base; panicles dichotomous, about half as long as the leaves: fruit smooth or slightly 5-ridged; accrescent calyx-lobes oblanceolate, obtuse. Planch. in Ann. Sc. Nat. Ser. 3, XIII, 318. DC. Prodr. XVI, 2, 602; Dyer in Hook. fil. Fl. Br. Ind. I, 299. *Ancistrolobus* sp. Griff. Notul. IV, 568, t. 605. fig. 2.

Andaman Islands. Distrib. Burmah.

Var. *pinangianus;* leaves sometimes oblanceolate-oblong, acute or sub-acuminate: panicles slender, lax, about as long as the leaves. *Ancistrocladus pinangianus*, Wall. Cat. 1054. Planchon in Ann. Sc. Nat. Ser. 3. XIII, 318; A. DC. Prodr. XVI. 2, 603; Dyer in Hook. fil. Fl. Br. Ind. I, 300.

Penang: Porter. Malacca: Maingay. (Kew Distrib.) No. 200. Singapore and Perak: King's Collectors. Distrib. Bangka, Sumatra, Burmah.

On some Newly-recorded Corals from the Indian Seas, by A. Alcock, M.B., C.M.Z.S., *Officiating Superintendent of the Indian Museum.*

Plate V.

[Received May 22nd, Read June 7th].

As so little has been written about the coral fauna of the seas within the limits of the Indian peninsulas, the following account of the corals dredged in recent years by the "Investigator," and by the late Professor Wood-Mason, may be of interest.

No reference is made in this paper to the true reef-forming corals.

FAMILY TURBINOLIDÆ.

Flabellum, Lesson.

1. *Flabellum stokesi*, Edw. & Haime, Moseley.

Flabellum stokesi, *Flabellum oweni*, *Flabellum aculeatum*, *Flabellum spinosum*, all of Milne-Edwards and Haime, Hist. Nat. des Coralliaires, vol. ii. pp. 96, 87 and 88.

Flabellum variabile, Semper, Z. Wiss. Zool., vol. xxii, 1872, p. 245.

Flabellum stokesi, Moseley, Challenger Deep-sea Madreporaria, p. 172.

This species, not hitherto recorded in the Indian Fauna, is common from Ceylon, along the east coast of India, to the Andaman Islands, at depths of from 20 to 30 fathoms. The numerous specimens dredged by Professor Wood-Mason in the Andaman Sea, and by the "Investigator" elsewhere, fully bear out Professor Semper's views as to the identity of all the four species of MM. Milne-Edwards and Haime above-cited. Undoubtedly Professor Semper's name for the species is very appropriate; but, as Professor Moseley says, it is necessary to retain one of the original names, and he has selected the specific designation *stokesi* as being least likely to lead to error.

Acanthocyathus, Edw. & Haime.

2. *Acanthocyathus grayi*, Edw. & Haime.

Acanthocyathus grayi, Milne-Edwards and Haime, Hist. Nat. des Corall., vol. ii. p. 22.

This species was described by MM. Milne-Edwards and Haime as of "patrie inconnue:" I have little hesitation in identifying with it a single specimen dredged by Professor Wood-Mason in the Andaman Sea.

PARACYATHUS, Edw. & Haime.

3. *Paracyathus indicus*, Duncan, var. nov. *gracilis*. Vide Duncan, Journ. Linn. Soc., Zool., vol xxi. 1889, p. 3.

The type of this species, which was brought by Dr. Anderson from Mergui, is in the Indian Museum, and I have now to record a distinct variety from the Bombay coast. This variety is characterized by its greater delicacy, and by the form of the corallum, which is subturbinate with a long slender pedicle.

4. *Paracyathus cavatus*, n. sp. Pl. V figs. 1. 1a., very near *Paracyathus crassus*, Edw. & Haime.

Corallum with a broad encrusting base, gently expanding into a low, slightly curved, sub-circular calice.

Costæ distinct from the basal encrustment, finely and distantly granular, every alternate one conspicuously salient.

Calice sub-circular, open, deep: the marginal axes in the same plane.

The finely and distantly granular septa are in five incomplete crowded cycles, and do not project far into the calice; those of the first three cycles are exsert. Those of the incomplete fifth cycle are small, and unite with those of the fourth cycle just below the calicular margin, while those of the fourth cycle unite with those of the third deep down in the calyx. The pali are in the form of numerous strong salient and very regular denticulations of the septal margins,—excluding those of the last cycle: those of the primary septa are much the most distinct, not because they are larger but because they are isolated.

The columella is very small, deeply-seated and concave, consisting of numerous minute close-set papillæ.

The tips of the septa are coloured pale madder-brown.

Greatest height of corallum 9 mm., major diameter of calice 11 mm., minor diameter of calice 10 mm., diameter of basal constriction 7 mm.

From the Persian Gulf.

The species is characterized by the very distinct alternately-salient costæ, by the deep hollow calice into which the septa project but little, and by the isolation of the series of strong paliform teeth opposite the septa of the first cycle.

5. *Paracyathus fulvus*, n. sp. Plate V, figs. 2. 2a., near *Paracyathus crassus*, Edw. & H.

Corallum low, with an extensively encrusting base, and a short stout gently curved cylindrical peduncle which expands gradually into a circular slightly drooping calicle.

Costæ indistinct at the base but gradually becoming distinct near

the margin of the calicle, where they are broad, finely granular and in all respects uniform.

The circular calice is open and moderately deep, with the marginal axes on the same plane.

The septa, which are in six systems, are exsert, with blunted slightly crenulated edges and distantly granular surfaces. Those of the first cycle are particularly distinct, being larger and stouter than those of any of the other cycles, projecting more into the calicle, and being more exsert beyond the margin. The quaternaries unite with the tertiaries near the columella. The pali have the form of stout granular pinnacles in three crowns, decreasing in size from without inwards, before all the septa but those of the last cycle.

The columella is small circular and slightly concave, and consists of numerous crowded granules.

In the type specimen the height of the corallum is 12·5 mm., the diameter of the calice 10·5 mm., and the diameter of the peduncle 7 mm.

The septa and pali are of a permanent tawny-brown colour.

The specimens in the Museum came from the telegraph cable in the Persian Gulf.

The distinctive characters of this species are the marked predominance of the primary septa, and the definition and regularity of the pali.

6. *Paracyathus porphyreus*, n. sp. Plate V, figs. 3. 3a, near *Paracyathus pulchellus*, Edw. & H.

Corallum with an encrusting base, above which it is suddenly constricted to again gradually expand into a slightly drooping, turbinate calice.

Costæ distinct from the base, equal, finely granular, depressed.

The calice is slightly elliptical, with marginal axes almost on the same plane: it is deep, but its cavity is about two-thirds filled by the septa.

The septa, which are crowded and exsert, are in four complete cycles in the young, with an incomplete fifth cycle in older examples: they have sharp and slightly crenulated edges and coarsely granular surfaces: those of the first two cycles are the most exsert: those of the fourth cycle unite with those of the third deep down in the calice behind the outer crown of pali.

The pali, which are in two crowns, are tall and large, those which stand opposite the tertiary septa being much the largest: the two crowns of pali, as seen from above, form a broad ring within the calice, very distinctly delimited both from the septa and from the columella.

The very deeply seated columella is large and concave, and consists of numerous close-set, blunt pinnacles.

In the type specimen the height of the corallum is 11·5 mm., the major diameter of the calice 10 mm. and the minor diameter 8 mm., and the diameter of the pedicle 5 mm.

The septa, pali, and columella are of a dull purple-black colour.

Dredged off the Arrakan Coast by the "Investigator:".

The distinctive characters of this species are (1) the delicacy of the calice wall in comparison with the stoutness of the septa and pali, (2) the large size of the pali and the very distinct definition of the palar zone, and (3) the punched-out appearance of the deep-seated columella.

HETEROCYATHUS, Edw. & Haime.

7. *Heterocyathus æquicostatus*, Edw. & Haime.

Heterocyathus æquicostatus, Milne-Edwards and Haime, Hist. Nat. des Corall., vol. ii, p. 51.

Numerous specimens were dredged by Professor Wood-Mason in the Andaman Sea. Every specimen has the base perforated and tunnelled for the residence of a worm, which no doubt lives as a commensal with the coral zoophyte, as I shall be able to show in the parallel case of *Heteropsammia*.

8. *Heterocyathus philippensis*, Semper.

Heterocyathus philippensis, Semper, Zeitschr. Wiss. Zool., vol. xxii 1872, p. 254, taf. xx. figs. 12–14.

Two specimens were dredged by Professor Wood-Mason in the Andaman Sea.

9. *Heterocyathus wood-masoni*, n. sp. Plate V, figs. 4. 4a.

The corallum is either low and discoid, or if it is higher it is so faintly and truncately conical that the diameter of the base is not much greater than that of the shallow plane calice.

The costæ, which begin on the flat basal surface near its margin, are equal, regular and very finely granular, and are separated from one another by deep incisions.

The calice is circular and quite flat, except for a central umbilication which marks the columella.

The septa are in four cycles, of which those of the third cycle are by far the smallest, while the primary septa along with the nearest quaternary of the adjoining half-system on each side are the largest. The six large primary septa with their large quaternary on each side thus form a six-rayed star, each ray consisting of three equal segments—namely a primary septum with a quaternary on each side of it.

The septa are hardly exsert, and they resemble the costæ, with which they are continuous, in being finely and uniformly granular.

Pali, in the form of series of very small denticles, stand before the primary and secondary septa, and also before the united margins of the tertiaries and quaternaries of each half-system.

The columella is distinct and consists of contorted granules. Dredged by Professor Wood-Mason in the Andaman Sea. Every specimen, as in the case of *H. æquicostatus* and *H. philippensis*, is perforated and tunnelled in the base by a worm.

The distinctive characters of this species are (1) the circular calicle almost or quite equal to the base in diameter, and not separated from the base by any constriction whatever, (2) the equivalence in size of the primary septa with the quaternaries standing immediately on each side, and (3) the small size of the pali.

Discotrochus, Edw. & Haime.

10. *Discotrochus investigatoris*, n. sp. Plate V, figs. 5. 5a.

Corallum discoid, thick and coarse. The almost horizontal base culminates in a coarse scar from which very distinct coarsely granular costæ radiate, the costæ being equally distinct throughout their course and all of uniform size.

The calice is very shallow.

The septa, which are in four cycles, are slightly exsert, with thick coarsely spinate or dentate edges: those of the first cycle are the most prominent, and those of the third cycle the least so, but the difference in size between any of the cycles is not very marked.

The columella consists of a few papillæ.

Diameter of disk 8 mm., greatest thickness 2 mm.

The single specimen was dredged by the 'Investigator' off the Arrakan Coast, and appears to be a denuded fossil.

Its possible fossil character is supported by the fact that, as Professor Wood-Mason informed me, fossil Crustacea were dredged either at or very near the same place during the same surveying season. The exact spot at which the coral was dredged was off the Islands of Rámree and Cheduba.

In relation to the possible fossil nature of this species I may refer to two papers in the *Records of the Geological Survey of India*, vol. ix. ("On the Mud Volcanoes of Rámri and Cheduba" by F. R. Mallet, F. G. S., p. 188, and "On the Mineral Resources of Rámri, Cheduba, and the adjacent Islands," by the same author, p. 207), to which my attention has been very kindly directed by Mr. T. H. Holland of the Geological Survey.

In these papers there is notice of historical evidence of the recent elevation of the land in this vicinity and along with it of much recent coral.

The rocks of this region appear from Mr. Mallet's observations to consist (1) of petroliferous shales and sandstones with nodules and strangulated beds of impure limestone and with shallow seams of lignite and coal, and (2) of minutely crystalline grey limestone,—all the strata being very irregular and being generally steeply inclined: as regards age the conclusion appears to be that they are Eocene Tertiary (Nummulitic) though the possibility is noted that some may be Cretaceous.

POLYCYATHUS, Duncan.

12. *Polycyathus andamanensis*, n. sp. Pl. V, figs. 6. 6a.

The colony is large enough to cover a *Conus* shell, 70 mm. in length, with a thin spongy crust. The corallites are small, very short, cylindrical, and are placed close together.

The costæ are distinct from the basal encrustment upwards, are alternately salient, and are usually covered with a white, vitreous epitheca.

The calices are open, shallow, and either circular or slightly elliptical. The septa, which are in four nearly complete cycles, are slightly and irregularly exsert: they are nearly equal in size and are coarsely granular.

The pali, which are in the form of strong denticulations, are distinct before all the septa.

The small deep-seated columella consists of a few small close papillæ.

The height of the corallites ranges from 2 to 3 mm., and the diameter of their calice from 3 to 7 mm.

The encrusting base and the epitheca are of a porcelain white, as are the tips of the septa; the calice wall, the septa, pali and columella being of a purple-black colour.

Dredged in the Andaman Sea by Professor Wood-Mason.

FAMILY OCULINIDÆ.

LOPHOHELIA, Edw. & Haime.

11. *Lophohelia*, sp.

Several dead branches of a species so eroded as not to be exactly determinable were dredged by the "Investigator" off the Konkan Coast in 446 fathoms.

I mention it as being the first observed occurrence of this family in Indian waters.

FAMILY EUPSAMMIDÆ.

Balanophyllia, Searles Wood, Duncan.

13. *Balanophyllia scabra*, n. sp. Pl. V, figs. 7. 7a.

Corallum simple, large, stoutly pedunculate, and gradually expanding, with a slight curve, into an elliptical calice.

The costæ, which are distinct from the base, are equal in size, uniform, and closely and conspicuously dentate.

The elliptical calice is deep.

The septa, which are crowded and very thin, are in five cycles, of which the last is not complete. Those of the first and second cycles are of equal predominant size and are slightly exsert. The quaternaries, especially those immediately adjoining the large septa of the first and second cycles, are larger than the ternaries, and unite with them not far from the columella. In those quarter-systems in which a fifth cycle of septa is developed these unite with the septa of the fourth cycle not far below the calicular margin, and the quinary nearest the large septa of the first and second cycles becomes the largest of the united triad. The edges of all the septa except those of the two first cycles are either ragged or cut into deep serrations, the teeth nearest the columella standing upwards like pali.

The columella is well-developed, spongy, and either plane or concave.

In the type specimen the greatest height of the corallum is 26 mm., the major diameter of the calicle 21 mm., and the minor diameter 15 mm.

Dredged by Professor Wood-Mason in the Andaman Sea.

Eupsammia, Edw. & Haime.

14. *Eupsammia regalis*, n. sp. Pl. V, figs. 8., 8a.

Corallum simple, free with traces of former adhesion, curved, cornute, compressed.

Costæ distinct in the upper two-thirds of the corallum, occasionally trifurcating, united at regular intervals across the deepish intercostal incisions by horizontal spicules.

Calice elliptical with the major marginal axis on a slightly lower plane than the minor, deep, open.

The septa are in five cycles, of which the last is not complete, and are exsert. Those of the first two cycles are of equally predominant size and stoutness, while those of the other cycles are smaller and diminish in size in order, except that in the quarter-systems in which a fifth cycle is developed the quinary septum immediately adjoining the primary is larger than its neighbour of the fourth cycle.

The quinaries unite with the quaternaries much nearer to the columella than to the calicular margin, and close to the columella the quaternaries unite with the tertiaries.

All the septa are thick, spongy and perforate at their exsert tips and near the wall of the calice, but they soon become thin and dense with surfaces so finely granular as to appear quite smooth to the naked eye.

The columella is broad, spongy, and strongly convex.

The colour of the corallum is white, of the soft parts bright scarlet.

The greatest height of the corallum is 27·5 mm., the major diameter of the calice 25 mm., and the minor diameter 17·5 mm.

Dredged by the "Investigator," off Ceylon, in 32 fathoms.

HETEROPSAMMIA, Edw. & Haime.

15. *Heteropsammia geminata*, Verrill.

Heteropsammia geminata, Verrill, American Journal of Science and Arts, second series, vol. xlix. 1870, p. 370. fig. 1.

About two hundred and fifty specimens were dredged by Professor Wood-Mason in the Andaman Sea. All have the base perforated and tunnelled.

16. *Heteropsammia rotundata*, Semper.

Heteropsammia rotundata, Semper, Zeitschr. Wiss. Zool., vol. xxii. 1870, p. 265, taf. xx, fig. 10.

I refer to this species several specimens from the Persian Gulf presented by Mr. W. T. Blandford, F.R.S.

17. *Heteropsammia aphrodes*, n. sp. Pl. V, figs. 9, 9a. Near *Heteropsammia ovalis*, Semper.

Corallum with a single calice, the wall formed of a fine lace-like reticulum (not spongy as in other species).

Calice oval and deep, its major diameter being not much less than that of the base—the basal "spur" excluded.

Septa in four beautifully regular and complete cycles. Those of the first two cycles are of equally predominant size, are exsert, and are very thick, inflated, spongy, and porose, even up to their edges. Those of the fourth cycle are rather larger than those of the third, and unite in front of them, with beautiful symmetry, near the columella.

The deeply seated columella is well developed, and is slightly concave.

The greatest height of an average corallum is 10 mm., with a calice having a major diameter of 10 mm., and a minor diameter of 8 mm.

Numerous living specimens were dredged by the "Investigator" off the Ganjam Coast, at a depth of 20–25 fathoms, and every one of them was provided with a commensal Sipunculoid worm.

With specimens kept alive for a short time on board it was observed that the worm was able to propel the coral in a rapid series of short jerky spiral movements.

The movements were performed with great ease, and there appears to be little doubt that we have here to do with a true case of commensalism, in which the worm serves the polyp as a locomotive agent, while the polyp affords particularly effectual protection—owing to its power of urtication—to the worm. As Professors Moseley and Semper observed in their species of *Heteropsammia*, the worm lives in a tunnel hollowed out of the coral-tissue, and no traces of any adventitious shell can be discovered forming a core.

In addition to the aperture for the exit of the worm, which is found in a special spur-like process of the base of the corallum, the side of the corallum about half way up is ringed with small punctures. Similar punctures are found in the coralla of other species of *Heteropsammia* and also *Heterocyathus*, and Professor Moseley regarded them as respiratory apertures for the use of the commensal worm.

Dendrophyllia, Edw. & Haime.

18. *Dendrophyllia* sp.

From the Orissa Coast, at 10 fathoms, we have a bush-shaped colony of long slender cylindrical corallites resembling *Dendrophyllia gracilis*, Edw. & Haime, in all respects except in the form of the columella which is very strongly convex, in some cases almost styliform, instead of being plane.

Cœnopsammia, Edw. & Haime.

19. *Cœnopsammia* sp.

From the Arrakan, Orissa and Ganjam Coasts respectively, we have three species of *Cœnopsammia* of the type of *C. urvillii*, Edw. & Haime, the colonies being in massive tufts from which the units of the colony project little or not at all.

I consider it better not to name any of these species until we have more material for comparison.

Rhodopsammia, Semper.

20. *Rhodopsammia carinata*, Semper.

Rhodopsammia carinata, Semper, Zeitschr. Wiss. Zool., vol. xxii. 1872, p. 257, taf. xix. fig. 6.

Numerous specimens were dredged by Professor Wood-Mason in the Andaman Sea, and by the "Investigator" off Ceylon in 32 fathoms. The gemmation from the calicular margin is well seen in both series of specimens.

21. *Rhodopsammia socialis*, Semper.

Rhodopsammia socialis, Semper, tom. cit., p. 260, taf. xx. fig. 1–14.

Several specimens were dredged along with *R. carinata*, both in the Andaman Sea and off Ceylon. Among them is a specimen showing budding to the third generation.

FAMILY FUNGIDÆ.

Cycloseris Edw. & Haime.

22. *Cycloseris mycoides*, n. sp. Pl. V, fig. 10.

Corallum almost circular, gently convex, with a flat or slightly concave base, from the centre of which close-set, equidistant, alternately, unequal costæ radiate—the larger ones being finely lamellar, while the alternate smaller ones are composed of a single series of fine granules.

The septa, which are in seven very regular and complete cycles, are close-set and convex, with very finely and evenly denticulate edges and very finely and striately granular surfaces. Those of the first two cycles are of equally predominant size and touch the columella, while those of the last two cycles do not reach half-way to the columella. Those of the fifth cycle unite together in each quarter-system in front of their quaternary, the united pairs then showing a tendency to further unite in each half-system in front of their tertiary.

The central fossa is long, narrow, and moderately deep, and lodges a narrow loosely reticulate columella.

The synapticulæ are numerous and coarse.

In an average specimen the major diameter of the corallum is 23·5 mm., and the minor diameter 23 mm.

Dredged by Professor Wood-Mason in the Andaman Sea.

This species differs from *Cycloseris cyclolites*, with which I have compared it, in the much greater delicacy regularity and symmetry of all its parts: it appears to be near *Cycloseris sinensis*, Edw. & H., and *Cycloseris discus*, Quelch.

Diaseris, Edw. & Haime.

23. *Diaseris distorta*, Edw. & Haime.

Diaseris distorta, Milne Edwards and Haime, Hist. Nat. des Corall., vol. iii. p. 55, pl. D. 12, fig. 4.

Several specimens were dredged by Professor Wood-Mason in the Andaman Sea.

24. *Diaseris freycineti*, Edw. & Haime.

Diaseris freycineti, Milne-Edwards and Haime, Hist. Nat. des Corall., vol. iii. p. 55; and Semper, Zeitschr. Wiss. Zool., vol. xxii., 1872, p. 269, taf. xxi. fig. 1.

Several specimens dredged by Professor Wood-Mason in the Andaman Sea. In all the specimens, except two very young ones, the corallum is tunnelled apparently by a worm, just as in *Heterocyathus* and *Heteropsammia*, except that the aperture for the exit of the worm instead of being on the base is at one side of the oral fossa.

Before going on to describe a new species of the genus *Diaseris*, I must here remark that our beautiful series of *Diaseris freycineti*, and of the species about to be described do not support Mr. Quelch's opinion that the species of *Diaseris* are merely the results of the fracture and repair of *Cycloseris*.

25. *Diaseris fragilis*, n. sp. Pl. V, fig. 11.

The corallum is flat and very thin. In its youngest stage the corallum is almost circular with a triangular lobe breaking through an arc of about 90° of its circumference and projecting to form a sector of a much larger circle.

This lobe appears with age to spread round the original disk until this in turn becomes a small lobe occupying not much more than 50° of the circumference of the grown coral.

The full-grown coral forms an irregular ellipse divided into four lobes in opposite pairs, one pair being large (each lobe with a margin equal to about 180° of the entire circumference), and the other pair being small (each lobe with a margin extending through about 55° of the entire circumference). The lobes are very distinctly delimited up to the very centre of the corallum, which has the appearance of being composed of four artificially cemented pieces.

The costæ are in the form of very close delicate granular striations, alternately unequal.

The septa, which appear to be in eight cycles in six irregular systems, are thin with very finely and evenly serrate edges and granular surfaces: they are usually low, but the primaries and secondaries are unequally elevated near the fossa.

The synapticulæ near the centre are coarse, close and equidistant, and form regularly concentric circles, as in *Bathyactis*, throughout the interseptal chambers: near the margin they are much more delicate, and are not equidistant.

The fossa is conspicuous and a columella is usually absent, although sometimes a few distant papillæ are visible.

The largest specimen measures 50 mm. in the major diameter and 41 mm. in the minor and is not more than 6·5 mm. in height to the tip of the highest septum.

Dredged in the Andaman Sea by Professor Wood-Mason.

Bathyactis, Moseley.

26. *Bathyactis stephanus*, n. sp. Pl. V, figs. 12, 12a.

Corallum very thin and fragile, circular, strongly convex, the base forming an inverted bowl. The costæ radiate from the centre and gradually become laminar or crested as they approach the margin: the primaries are the most distinct.

Septa in six regular systems and five complete cycles arranged exactly as in *Bathyactis symmetrica*. Those of the first three cycles are foliaceous, with crenulated surfaces and irregularly lobate edges.

Synapticulæ distinct in ten to twelve zones, which though fairly regularly concentric do not at once attract the eye by this character as they do in *Bathyactis symmetrica*. Columella distinct, umbilicated.

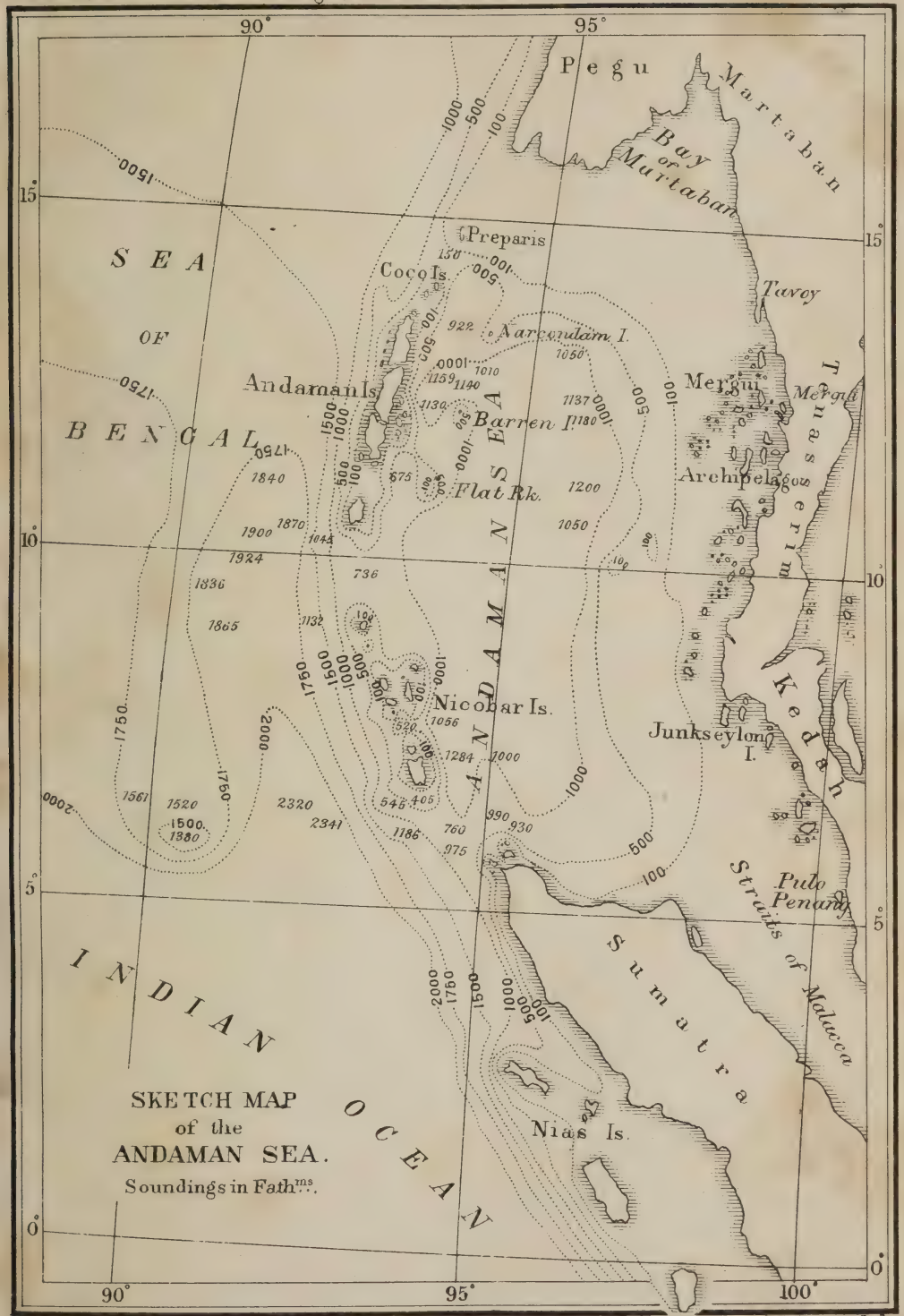
Diameter of corallum 34 mm., its greatest height from margin of base to the tips of the tallest foliaceous primary septa 17 mm.

The colour of the soft parts is a ruddy mauve.

Four specimens from the Bay of Bengal off the Kistna Delta in 678 fathoms.

EXPLANATION OF THE PLATE.

Figs. 1, 1a, *Paracyathus cavatus*, natural size;
Figs. 2, 2a, *Paracyathus fulvus*, natural size;
Figs. 3, 3a, *Paracyathus porphyreus*, natural size;
Figs. 4, 4a, *Heterocyathus wood-masoni*, natural size;
Figs. 5, 5a, *Discotrochus investigatoris*, enlarged five times;
Figs. 6, 6a, *Polycyathus andamanensis*, natural size;
Figs. 7, 7a, *Balanophyllia scabra*, natural size;
Figs. 8, 8a, *Eupsammia regalis*, natural size;
Fig. 9, *Heteropsammia aphrodes*, natural size; and 9a, viewed from above, enlarged twice;
Fig. 10, *Cycloseris mycoides*, natural size;
Fig. 11, *Diaseris fragilis*, natural size;
Figs. 12, 12a, *Bathyactis stephanus*, natural size.

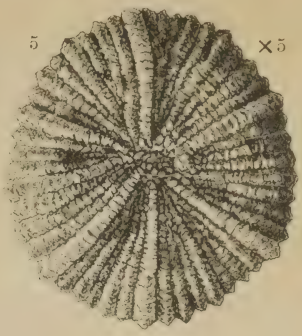


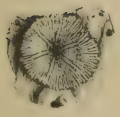
D. Prain delt. A. C. Mukerjei lith.

1

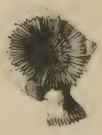
2

3


5 ×5


1a

2a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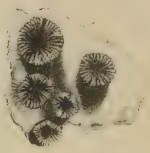
4

4a


6

5a ×5

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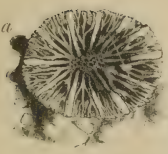
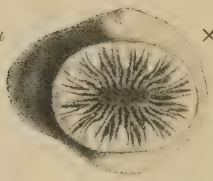
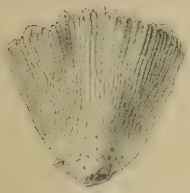
7


7a


9a ×2

9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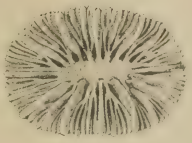
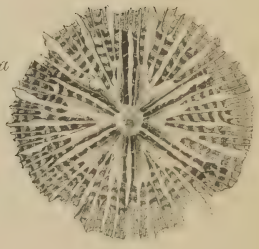
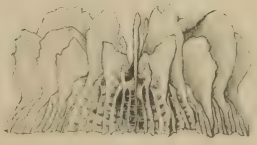

8a

10


12a

11


12

JOURNAL

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No. III.—1893.

On some Actiniaria *from the Indian Seas.*

By A. Alcock, M.B., C.M.Z.S., *Offg. Superintendent of the Indian Museum.*

[Read July 5th.]

In this short paper I propose to notice only the two aberrant Tribes, *Zoantheæ* and *Cerianthineæ*.

I. Zoantheæ.

The *Zoantheæ* are a tribe of sea-anemones distinguished, according to the limitations of R. Hertwig in his Report on the 'Challenger' *Actiniaria*, where full references are given, by the possession of septa of two kinds—larger septa (*macrosepta*) which alone bear mesenteric filaments and reproductive organs, and smaller septa (*microsepta*) which are sterile.

The *Zoantheæ* include two families—the *Zoanthidæ* which are peculiar among all sea-anemones in forming colonies of which the units are connected together by a canaliculated coenenchyma, and the *Sphenopidæ* which are solitary in the sense that the individuals are not morphologically connected, but appear to be gregarious in habit.

The majority of the *Zoantheæ* are characterized by the possession of a thick test very homogeneously compacted of small grains of sand.

The following genera and species occur in the Indian Seas, and are represented in the collection of the Indian Museum :—

FAMILY Zoanthidæ.

ZOANTHUS, Cuv.

1. *Zoanthus confertus*, Verrill.

This species was dredged by the "Investigator," the exact locality being uncertain, but probably off the Pegu coast.

2. *Zoanthus solanderi*, Lesueur.

This species occurs at Galle.

EPIZOANTHUS, Verrill.

3. *Epizoanthus stellaris*, R. Hertwig.

Two species of *Epizoanthus* very commonly occur in the Andaman Sea, at depths of 200 to 500 fathoms, encrusting the anchor-ropes of the glass-rope sponges (*Hyalonema*): one of them appears to be identical with the above-named species from the Philippine Sea.

FAMILY Sphenopidæ.

SPHENOPUS, Steenstrup.

4. *Sphenopus marsupialis*, (Gmelin).

This species is very common in shallow water all along the eastern coast of India, especially on the soft muddy bottom at the debouchement of the great rivers.

I can never recollect dredging it except in mass, and this seems to point to the conclusion that it is gregarious.

5. *Sphenopus arenaceus*, R. Hertwig.

We have six specimens from the Sandheads.

It is readily distinguished from *S. marsupialis* by the cylindrical body, by the thinner test, by the double row of tentacles, by the less powerful oral sphincter, and by the character of the œsophageal groove which although very distinct is not such a deep-cut channel as it is in *S. marsupialis*.

6. *Sphenopus arenaceus*, var. *barnettii*.

I propose to notice separately a variety in which there is a constant difference in external form, the oral end of the body being inflated, while the lower part forms a long vermiform peduncle. The external appearance, in short, approaches the figure of *Sphenopus pedunculatus*, Erdmann, R. Hertwig, in vol. XXVI of the 'Challenger' Reports Actiniaria, Suppl., Pl. I., fig 11.

The variety comes from the Sandheads, where it was dredged by Mr. Barnett.

II. Cerianthineæ.

The *Cerianthineæ* are distinguished from other sea-anemones (R. Hertwig, 'Challenger,' Reports, vol. VI, p. 123) in having the septa unpaired.

Cerianthus, Delle Chiaje.

7. *Cerianthus andamanensis*, n. sp.

The body is loosely encased, up to the outer tentacular crown, in a soft sheath of a dull cinnamon-brown colour, the oral disk between the two crowns of tentacles is of the same colour but lighter, and the tentacles with the central part of the oral disk are creamy white.

The tentacles of the outer crown are very thick-set, and number about 160; those of the inner crown are not nearly so thick-set, and number hardly half as many.

The septa and mesenteric filaments extend to the bottom of the gastral cavity.

The base is perforated centrally.

Three specimens from Port Blair. In the contracted state the shape of the body is beautifully caryophyllaceous, and the length of the largest specimen is a little short of four inches—(99 millim.) This species appears to be very close to *Cerianthus americanus*, Verrill, which it aproaches in size, judging from the magnitude of the spirit specimens.

Note on some methods of preparing botanical specimens, communicating Memoranda by Messrs. C. Maries, F.L.S., *and* R. Pantling.—*By* D. Prain, M.B.

[Read June 5th.]

Usually the preparation of botanical specimens is easy; some natural families, however, give a good deal of trouble. Those who have private herbaria are as interested to hear of improved methods of treating such families, as are those who look after public collections. The writer, therefore, would call general attention to modes of dealing with three troublesome families—*Magnoliaceæ*, *Coniferæ* and *Orchidaceæ*.

I. Magnoliaceæ. The *Champak* family is not troublesome to preserve as to the leaves, but the flowers are apt to go to pieces. If, however, pieces of blotting-paper are carefully insinuated between the petals before the specimen is laid in drying-paper, and if the specimen is then rapidly fire-dried, even adult flowers may be preserved entire. Nothing, however, prevents the shrinkage of the large leathery petals. In this order shrinkage is so excessive and so unequal, that in the case of

herbarium specimens the estimation of the size of the flowers becomes to some extent guess-work.

Those who know Rangoon may recollect the practice of selling bottles of flowers on the stairs of the Shwe-Dagon Pagoda. Unless, however, their stay has been long enough, or their interest sufficiently great, to have led them to notice that the flowers in these bottles are not fresh but preserved, they may have supposed, as the writer did, that the medium in which the flowers are kept is water.

Everyone, however, has not been so void of curiosity. When Assistant Surgeon C. L. Bose,* was in Rangoon in 1885, he was struck by the length of time the flowers were kept, and brought some with him to Calcutta for examination. Dr. Warden, then chemical examiner, and Mr. Bose found on examining the fluid that it was a solution of Alum. The solution is of no special strength; the Burman, being a happy-go-lucky individual puts some Alum into the water along with the flowers and is not particular as to the amount.

Mr. Bose brought only *Champak* petals; some of these are in shape, size, colour and consistence much as they were when taken from the tree eight years ago. Here then we seem to have the means of overcoming the difficulty, hitherto insoluble, of preserving the natural size in specimens of *Magnoliaceous* flowers.

Though only *Champak* was brought by Mr. Bose, the writer recollects seeing *Plumieria* and *Nymphæa* flowers as well, and a bottle in which Dr. Warden placed some green leaves with a 1% Alum solution at the time he examined the Rangoon bottle has its contents very much as they were when he put them in. There is, therefore, no reason why the use of Alum solution should be confined to *Magnolia* flowers.

It should be understood that the use of Alum solution is only suggested as an auxiliary to the usual means of preserving specimens. Wet preparations are to be avoided; they are difficult to handle, difficult to keep, difficult to house, and still more difficult to carry about. But occasions arise when wet specimens are of the greatest moment as supplements to dried ones, and the Burmese preservative has the advantages over spirit of not discolouring the specimen or rendering it brittle. Most important of all, one can carry Alum about as a solid and make a solution when required.

If the bottles are not carefully sealed the specimens do not keep. The flowers immersed in the fluid do not suffer, but as the water evaporates the flowers at the top get exposed to the air, decay, and fall in a flocculent mass to the bottom. This flocculent matter keeps pushing up others to undergo the same decomposition. But from a well-stoppered bottle—

* Assistant to the Chemical Examiner to Government, Calcutta.

a glass stopper with wax is best—the fluid does not evaporate; the flowers, therefore, do not reach the air and seem to keep indefinitely.

II. Coniferæ. The *Pine*, *Fir* and *Spruce* family is usually very troublesome to preserve both in the field and afterwards in the Herbarium, from the readiness with which the cones fall to pieces and the leaves (needles) drop off. In the Calcutta Herbarium there are a number of beautiful specimens of Japanese *Conifers* presented by Mr. C. Maries, F.L.S.,* who collected them. The writer anxious to learn the secret of the success with which so troublesome a family had been treated asked Mr. Maries if he would kindly explain his method. Mr. Maries' reply, which he has courteously permitted the writer to communicate to the Society, is as follows :—

"*Conifer* specimens of the *Abies* or *Picea* section are generally rather "difficult to dry. When I was in the island of Yesso, in the North "Pacific, I was very much troubled with them. One night I arrived "very wet at my rooms and stacked my branches of *Abies*, with the "cones attached, round a big charcoal fire. I fell asleep and woke up "next morning to find my specimens dried beautifully. After this I "always dried them slowly over a charcoal fire, first wiring or wrapping "up the cones. All fir-cones, except Pine, or Spruce, or Cedar, should "be tied up either with cotton or wire immediately they are gathered. "The Spruce section is the most difficult to dry, even roasting is not "always a success."

Mr. Maries goes on to say :—"The way I dry ferns and leaves "of trees for fitting up my bird-cases" (in the Gwalior State Museum) "to preserve their natural shape, is to take some very *clean*, washed "sand, arrange the leaves in a *clean* box and fill in with hot sand, and "keep at a temperature of 100° to 120° Fh. or even more. They soon "dry (I imagine Spruce would dry like this if very hot) and flowers "dry beautifully in this way, some keeping their natural colours in a "most remarkable manner. When I was young and living in London, an "old gardener taught me this; he used it for ferns and roses for winter "decorations when fresh ferns and flowers were scarce. All the dried "flowers one sees in florists' shops in London are dried in hot sand. "—C. Maries."

III. Orchidaceæ. The *Orchid* family is perhaps the most troublesome of all natural families to represent in Herbaria. In all the epiphytic kinds the leaves and, in most of them, the flowers also are apt to drop off when the specimens are dried in the ordinary way, while even in ground Orchids the pressure that has to be applied during drying usually so distorts the flower that a true conception of the relative

* Superintendent of the State Gardens and State Museum at Gwalior.

position of its parts becomes impossible. This is very unfortunate, because there is no natural order where a proper understanding of the position of parts, particularly of the lip and the column, is so necessary. Spirit preparations are most unsatisfactory. If the spirit is sufficiently strong to preserve the flowers the parts become so brittle that when handled they go to pieces; if weak enough to prevent this hardening and consequent friability the spirit does not adequately preserve the specimens. The jars and bottles in which the specimens are placed, moreover, are very apt to get broken, and any one who has tried it will testify to the worry that is caused by the necessity of having to carry about a stock of alcohol. Dr. Schweinfurth when travelling in Africa, made use of a most excellent modification of the method of preservation in spirit. He laid his specimens between sheets of drying paper, laid these in tin-boxes and soldered them up after soaking the paper thoroughly with spirit. He was thus able greatly to reduce the initial stock of alcohol and was freed from the subsequent anxiety of possible breakages. But the objections to spirit as a preserving medium for flowers are not obviated by this mode of applying it, and it remains to be seen whether the Alum solution will answer as a subtitute if used in this way.

In the meantime Mr. R. Pantling,* who for many years has made a special study of Orchids, has perfected a method of drying them so far in advance of anything hitherto accomplished that it is highly desirable, that the details of his process should be made known. At the writer's request Mr. Pantling has supplied these details and like Mr. Maries, has courteously given him permission to communicate the account to the Society. This memorandum is given below; it will be noticed that it consists of a happy combination, suitably modified, of the ordinary method of fire-drying recommended for all ordinary plants with the hot-sand process mentioned by Mr. Maries as that practised by florists in Europe.

"*To dry Orchid Specimens.*—In order to preserve *Orchids* so that "the leaves and flowers remain intact and do not fall away in fragments "as invariably happens to epiphytal species when pressed in the ordi- "nary way between drying paper, the procedure to be adopted should "be as follows. Procure a light metal box—14 inches, by 12 inches, "by 6 inches deep is a convenient size—and place over the bottom half- "an-inch of sand. Arrange a specimen between two sheets of thin "paper inside the box and cover over with a layer of sand taking care, "as far as possible, that the interstices between leaves, etc., are filled "up. Repeat this until the box is full, then place it on a stove or above

* First Assistant, Department of Cinchona Cultivation in Bengal.

"a fire and dry with a brisk heat. No weights for pressing are neces-
"sary. As a general rule, the sand at the commencement of drying
"should not be allowed to attain a greater heat than can be borne by
"the hand, and this should be lessened as drying proceeds or the flowers
"may become scorched and rendered useless for purposes of dissection.

"Occasionally species (*Dendrobium Pierardi* Roxb., and *Phajus*
"*alba* Lindl.) are met with whose perianths will adhere to the paper;
"the removal of the perianth cannot then be effected without mutilation.
"This may be obviated by using porous drying-paper or blotting-paper
"instead of the thin kind recommended above.

"The advantages of drying in hot sand as compared with the
"universally adopted method in paper are:—*First*, the rapidity in pre-
"paring specimens; plants belonging to such genera as *Saccolabium*,
"*Vanda*, *Cleisostoma*, etc., being ready within a week against a period of
"three to four months by the old method. *Secondly*; when finished the
"specimens will be found preserved in their entirety and will not fall
"to pieces. The column and lip will be found to have suffered little,
"as the pressure of the sand is not sufficient to cause any material dam-
"age to these organs".—R. Pantling.

The boxes that Mr. Pantling has found handiest for his purpose are old kerosine tins cut through lengthways; one is placed within the other to give more strength to the tin and a rivet or two hammered through the seams as the solder runs when the boxes are over the fire. The only thing to be guarded against in the process is the adhesion of the flowers of certain species to the paper, and Mr. Pantling shows how this is easily overcome.

The possibilities of this method either as recommended by Mr. Pantling or with slight modifications for the drying of succulent species generally, such as the *Cactus* family and fleshy members of the *Spurge* family, as well as for families like *Scitamineæ*—the ginger family—and for water plants, where the flowers are very delicate and therefore very difficult to dry seem considerable and the plan is well worth trying for them as well as for orchids.

Blind root-suckers of the Sunderbans.—*By* R. L. Heinig, *Deputy Conservator of Forests, Bengal, Communicated by the Natural History Secretary. Plate VI.*

[Read August 2nd.]

The name "Sunderbans" is applied to the tract of littoral forest and cultivation that occupies the southern portion of the Ganges Delta, extending from the Hooghly river to the Meghna in the districts of the 24-Parganas, Khulna, and Backergunge. This tract is, roughly, 5,000 square miles in area, and comprises a large number of low-lying swampy islands formed by the principal rivers and their connecting water-channels.

The State Forests occupy the portion that extends from the Hooghly river to the Baliswar, on the western border of Backergunge. They are divided, both geographically and as to their legal status, into two approximately equal and well-defined areas, namely, the *Protected* Forests, extending from the Hooghly river to the Raimangal, in the district of the 24-Parganas; and the *Reserved* Forests, extending from the Raimangal river to the Baliswar in the Khulna district.

The *Protected* Forests are traversed by rivers not directly connected with the Ganges, and resembling estuaries or long arms of the sea; these rivers are very saline and subject to tidal influences throughout.

The principal species of forest tree is *Gozán* (*Ceriops Candolleana*, Arn.), a tree that does not develop root-suckers, but has short buttresses. It reproduces itself abundantly, and the innumerable stems and tangled roots of this species and of others with which it is associated, *Gengwá*, (*Excœcaria agallocha*, Linn.); *Hantál*, (*Phœnix paludosa* Roxb., &c.), serve, in the absence of herbaceous undergrowth, to protect the surface soil from erosion during tidal inundations, and to induce the deposit of alluvial mud.

The *Reserved* Forests are traversed by rivers directly connected with the Ganges, that bring down vast bodies of fresh water, especially during the rains. The principal species of forest tree is *Sundri* (*Heritiera fomes*, Buch.). The accessory species are *Pussur* (*Carapa moluccensis*, Lam.), *Amúr* (*Amoora cucullata*, Roxb.), *Keora* (*Sonneratia apetala*, Lam.), *Ora* (*S. acida*, Linn. f.), and a few others. Each island is bordered by a zone of characteristic growth consisting of *Golpatta* (*Nipa fruticans*, Wurmb.), *Hantál*, species of the mangrove family, *Keora*, *Ora*, *Kúmia* (*Barringtonia racemosa*, Blume.), &c. Behind this zone of riparian growth occurs the *Sundri* forest, pure, or mixed with

a few inferior species. Towards the sea coast, where the water of the rivers is markedly saline, especially during the dry months of the year, *Gorán* and *Gengwá* form the predominating species, and *Sundri* trees are comparatively few in number, and of inferior growth. The *Sundri*-producing tract resembles that on the west in the general absence of grass and other herbaceous vegetation, but differentiates from it entirely by the presence of innumerable blind root-suckers.

The magnificent rivers that traverse the Sunderbans, many of them of considerable breadth and depth, bring down, during the monsoon months, vast quantities of silt, some of which is deposited to form *churs* or sand-banks.

On the subsidence of the waters at the close of the rains those sand-banks, the surface of which is left exposed at low tide, are soon covered by a luxuriant growth of grass which effectually binds the soil, induces further accumulations of silt, and arrests floating seeds.

It is not surprising that under the forcing conditions of a rich soil, a moist warm climate, and abundance of light, seedlings on these new islands should make extremely rapid growth, forming in a few years an uninterrupted canopy, in the dense shade of which it is impossible for the grass to live.

When the grass has disappeared there is a continual danger of the island wasting away by erosion, the banks being liable to be undermined and swept away by the rivers, and the whole surface, inundated during high spring-floods, is subject to denudation under the considerable force (to be seen to be fully appreciated) with which the water pours away at every point of egress after the tide has turned.

The soil of the islands eventually consists of a thin top-layer of alluvial mud overlying a thick layer of moist, black soil in which the large quantities of wood *débris* that accumulate in these forests undergo slow decomposition with the generation of gases having the odour of sulphuretted and carburetted hydrogen. The top-layer of soil excludes atmospheric air, and imprisons the gases generated in the miasmic mud beneath. Occasionally the gases find vent along river banks at low tide, and during storms when the stems of the forest trees sway to and fro and cause the upper layers to be disturbed.

Each species of tree found growing in the swamp-forests of the Sunderbans has a root-system well adapted not only to anchor the tree firmly in the unstable medium below, but also to protect the mud from the effects of erosion. The roots do not penetrate the soil to a greater depth than 8 to 10 feet, but in this shallow layer they form a tangled and confused net-work in which the tap-root is not distinguishable. Some species produce adventitious roots, and others buttress

freely, even at an early age; but perhaps the most curious adaptation of all, of means to ends, is to be found in the development of blind root-suckers.

The following species of forest trees in the Sunderbans produce blind root-suckers, namely, *Sundri*, *Pussur*, *Amúr*, *Keora*, *Ora*, and *Báen* (*Avicennia officinalis*, Linn.).

The root-suckers are woody processes, growing in an upward direction, and developed at irregular distances along the whole course of the roots of the above-mentioned species. They project from 1 to 3 feet above the surface of the ground, and apparently cease to make further growth upwards when the apex has reached the level of the highest spring-tides. They are called blind from the circumstance that they are destitute of buds, and incapable of producing buds under any conditions. The portion below ground is often furnished with rootlets, but the part above ground is invariably naked. The tender tops of the suckers are frequently gnawed by pig and deer, but this does not destroy their vitality, and only results in the formation of apical knobs and bifurcations.

The mechanical effect of the root-suckers of all the species that develop them (except *Báen*) is to enormously increase the holding power or grip of the roots on the soil, and thus to cause a far greater resistance to be offered to the uprooting of trees by storms, and generally to maintain the stems of the trees in an upright position; to prevent the erosion of the surface soil during high-tide inundations; to check the force of the egress of flood-water, and to induce deposits of alluvial mud; to detain seeds floated on to the islands at high tide, and thus aid in the natural reproduction of all species; to arrest fragments of fertilising wood *débris* that would, in the absence of the root-suckers, be swept into the rivers.

The accompanying plate illustrates the general form and relative length of the root-suckers of different species.

Sundri suckers are far more numerous than those of any other species, and their flattened shape renders them fit to fully exercise all the mechanical functions noted above. The suckers of *Pussur* and *Amúr* are met with in the low-lying localities affected by trees of these species; they are consequently, as a rule, much longer than those of *Sundri*. The suckers of *Keora* and *Ora*, species that are found only on river banks, are short on the high ground of the banks and long on the river-side. This accords with the general observation that the upward growth of a sucker continues until its apex has reached the level of high-water mark.

Keora sends out very long roots into the mud of river beds. These roots act as spurs deflecting the course of the current, causing accumulations of silt, and sometimes leading to the complete silting up of rivers. Innumerable suckers proceed from these roots up to distances of 150 feet and more from the parent tree, and aid in fixing whatever silt has accumulated, and inducing the deposit of more. These suckers are exposed at low tide, but are subjected to long-continued submergence daily until the bank has risen sufficiently to allow the tops to remain above the level of high tide.

Báen suckers are of exceptional interest. Their form and flexibility render them almost useless as agents for the prevention of erosion and the arrest of silt, seeds, and wood *débris;* and it is certain that they do not have the effect of enabling trees of this species to maintain a vertical position. *Báen* trees after attaining a girth of 2 to 3 feet, incline from the vertical. In the case of large trees, 15 feet in girth and more, the inclination from the vertical is often considerable; but the trees of this size have long since passed their maturity, and are merely light, hollow shells.

The most interesting fact regarding the root-suckers of this species is that they have been found, on examination of the internal structure, to contain vessels that are supposed to serve as passages for the conveyance of atmospheric air to the roots.

It has been remarked that the top-layer of alluvial mud, a very fine silt, excludes atmospheric air from the lower stratum of miasmic mud wherein the wood *débris* of the forests decomposes and large quantities of gas are generated. The fact has also been noted that the root-suckers continue to make upward growth until their tops are above high-water level. It is accordingly considered probable that the root-suckers of all the species that produce these curious processes not only discharge the mechanical functions already referred to, but are provided with a structure that enables them to supply atmospheric air to the roots.

The Petrology of Job Charnock's Tombstone,—*By* Thomas H. Holland, A.R.C.S., F.G.S., *Geological Survey of India.*

[Received August 29th, Read November 1st.]

At the suggestion of the Rev. H. B. Hyde, I recently examined the tombstone preserved in the 'Charnock Mausoleum,' St. John's Churchyard, to the memory of Job Charnock.* Apart from its historic interest, the rock itself, being of a type hitherto undescribed, is of sufficient scientific value to call for a description.

The abundance of blue quartz, the occasional crystals of garnet, the black, and sometimes bronzy-looking, pyroxene, and the cleavage faces of the felspars are characters which are at once striking features in the hand-specimen.

Under the microscope, the rock is seen to be granitic in structure ; that is, it is perfectly crystalline throughout, with the crystals mutually interlocked, and the intergrowth so perfect that in places a beautiful micro-pegmatitic structure results. The following minerals can be identified (1), Quartz. (2), Orthoclase (Microcline). (3), Plagioclase. (4), Hypersthene. (5), Garnet, and (6), Magnetite.

(1.) The QUARTZ-CRYSTALS are crowded with minute acicular inclusions, the structure of which cannot be made out with the microscope ; they are arranged without discoverable regularity : and are probably the cause of the blue colour seen in hand-specimens. Blue quartz-crystals have been noticed before in granites and granitites, as in that from Rumburg in Sweden.

(2). ORTHOCLASE and MICROCLINE. Most of the potash-felspars show the remarkable and unmistakable microcline structure. Occasionally also the orthoclase is seen presenting the "streifige" appearance due to regularly arranged intergrowths with a plagioclase, giving rise to the structure described by Becke as micro-perthitic. To prove the identity of this felspar I have isolated crystals having a specific gravity of 2·59, and examined them chemically by Szabo's method.

(3). PLAGIOCLASE occurs only in small quantities. The isolated crystals show the characteristic twinning, with extinction-angles approaching those of oligoclase.

(4). HYPERSTHENE occurs, not in large quantities, but presenting its characteristic pleochroism and straight extinction. The presence of this mineral is a feature of exceptional interest from the fact that, so far as I am aware, a hypersthene-granite has never before been record-

* Job Charnock died in 1693, and the tombstone was erected about two years later.

ed, although the mineral has been frequently found as a constituent of the intermediate, basic and ultra-basic holocrystalline rocks. The precise reasons why the micas, hornblendes, and, more rarely, augites should occur as the ferro-magnesian constituents of granites, and not hypersthene, have never been accurately settled. The discovery of hypersthene, therefore, in this capacity fills a very well-marked gap in the granitic series, and for the time we can do no more than record as precisely as possible its nature and mode of occurrence, with the hope that in future the facts may be of service in framing an hypothesis for explaining the fact that chemically similar magmas, under special conditions of temperature and pressure during the process of consolidation, give rise to different mineral species.

(5). GARNET of the almandine variety occurs very sparingly in the rock, and seldom shows anything approaching idiomorphic crystalline form.

(6). MAGNETITE in small grains is sparsely scattered amongst the other minerals.

The rock has a *specific gravity* of 2·646, agreeing thus with normal granites.

In microscopic and macroscopic characters this rock agrees with certain specimens which I have recently collected in the Madras Presidency. At different places in the south of India (Pallavaram in the Chingleput district, the Shevaroy and Nilgiri hills, in N.-W. Madura, and in Travancore) there occur exposures of igneous rock in which hypersthene is a constant constituent, and which at the same time exhibit every gradation in acidity, from hypersthene-granite, the most silicious (acid), to pyroxenite the most basic. These rocks, although their exposures are now separated by such distances from one another, I believe to have been derived from a common molten magma: they belong to one "petrographical province," and the differentiation of the originally homogeneous molten material into masses so widely distinct in chemical composition can be shown to be in agreement with well-established, though recent, physical principles.

The massive rocks of the Nilgiri Hills, and the Shevaroys, as well as the similar rocks found in the localities mentioned above, have been hitherto regarded as belonging to the great metamorphic series of the South. Observations made during recent visits to the Madras Presidency have, however, convinced me that this series, together with certain others not now under discussion, must be looked upon as intrusive igneous rocks of younger age than the normal gneiss.

The evidences for these conclusions I hope shortly to produce in detail. For the present, however, we are concerned in identifying

Job Charnock's tombstone with the pypersthene-granites of the Madras Presidency; and from its proximity to the cost and to Madras, it seems likely that Pallavaram would have been selected by the earlier agents of the East India Company as a source of this handsome rock. Nearly all the old tombstones collected together in St. John's Churchyard are of the same rock; for example that of Job Charnock's son-in-law, Jonathan White (1703), and Mrs. Jane Smart (1753).

Briefly, the points in which these rocks agree with those of Pallavaram, and upon which I base this identification, are these :—

(a). *Structure* :—
- (1). Micro-perthitic structure.
- (2). Granophyric (micro-pegmatitic) structure.

(b). *Composition* :—
- (1). The presence of potash-felspar in the form of microcline.
- (2). „ hypersthene.
- (3). „ blue quartz.
- (4). „ almandine garnet.

(c). *The combination* of these minerals with the above-named structures. In this association hypersthene is especially note-worthy for the reasons already stated.

As this is a new type of rock, and modifications of it occur by the introduction of accessory minerals, I would suggest for it the name *Charnockite*, in honour of the founder of Calcutta, who was the unconscious means of bringing, perhaps, the first specimen of this interesting rock to our capital.

On a slab of Chinese agglomerate lava bearing a Chinese inscription discovered in St. John's Churchyard, Calcutta. *By* T. H. Holland, A.R.C.S., F.G.S., *Geological Survey of India.*

[Received October 26th;—Read November 1st, 1893.]

(With Plate VII.)

Through the kindness of the Revd. H. B. Hyde, I have been enabled to examine the slab bearing a Chinese inscription and discovered by him in St. John's Churchyard.

The slab has been imperfectly polished on the face bearing the inscription, and at first sight presents the character of a common artificial concrete, for which I at first mistook it. But on removing a fragment from the back of the slab and examining it in the laboratory, I found it

to be a siliceous lava, which, though of course formed by natural means is, indeed, comparable to a concrete in ways other than appearances. It is a rhyolitic lava of a kind occurring in different parts of China, which, previous to consolidation, has included fragments of other rocks and now presents the patchy appearances of the agglomerate lavas and pipernos described by Fritsch and Reiss as varieties of eutaxite.*

Thin slices examined under the microscope leave no doubt as to the nature of the rock :—Corroded quartz-crystals embedded in a cryptocrystalline and microlitic magma are scattered irregularly through the slide. Occasionlly these preserve in part their original bi-pyramidal outlines, but the magma has corroded the majority of the crystals into irregular shapes. A curious feature worthy of record is the way in which many of the quartz-crystals are traversed by a series of cracks without discoverable regularity. These cracks recall the tessellated appearance of the polysynthetic porphyritic crystals described by Gen. McMahon in the eurite of Tushám Hill, 85 miles north-west of the town of Delhi.† But as a rule, in the present instance, the small fragments, although separated from one another by a series of cracks, all have the same optical orientation, whilst in the Tushám specimens the grains are, according to Gen. McMahon, oriented in different directions. I have found, however, one case of a quartz-crystal in which, after the formation of the cracks, many of the fragments have been slightly displaced, so that whilst the position of extinction is the same for the individuals in some of the pairs, others show slight differences, and still others have been moved through several degrees. Gen. McMahon explained the structure of the quartz-crystals in the Tushám rock as the result of rapid cooling after eruption, and I think the present case, in which many of the crystals are simply cracked more often without displacement of the fragments, are certainly more easily explained in this manner than by the other suggestions which, in his paper, Gen. McMahon has considered and rejected. Relief of pressure would also contribute to the same effect. A similar structure can be produced in clear quartz-crystals by rapidly cooling them from a red heat, the crystals becoming white and losing their transparency from a similar cause.

Next to the quartz-crystals in abundance amongst the porphyritic constituents are the felspars, some of which are of a plagioclase variety, and all greatly kaolinized. Black and brown patches of ferruginous material occur as relics of the ferro-magnesian constituents of the original rock. Secondary minerals like chalcedony occur in small quantities infilling cavities.

* *Geologische Beschreibung der Insel Tenerife*, 1868, p. 420.

† *Min. Mag.*, Vol. VIII. (1888), p. 10.

Lumps of andesitic rocks are common as inclusions in the matrix, which in places shows damascened and eutaxitic structures.

The specific gravity of the rock is 2·35. Thin splinters fuse before the blowpipe to a white vesicular glass.

Comparison with Chinese rocks :—The peculiar structures presented by this rock are of especial interest from the way in which they can be parallelled amongst the Chinese eurites and rhyolites. The damascened structure and the included fragments of a similar andesitic rock I have previously described in the Korean acid lavas.*

Amongst the rocks which I have collected in China, there is a specimen of eurite from the Victoria Peak, Hong Kong, in which the porphyritic crystals of quartz are cracked in the same peculiar manner. The felspars, also, in this rock are in part plagioclastic, and irregular patches of small biotite bundles resemble in shape the ferruginous masses occurring in the slab. But although the Hong Kong rock shows a very distinct flow structure, the groundmass is composed wholly of microgranulitic material, and there is a notable absence of the andesitic foreign inclusions. Whilst, then, the porphyritic constituents of the slab agree with those of this rock, the groundmass shows that the conditions of consolidation were different; but although the circumstances of solidification were not the same there seems little doubt that the slab in St. John's Churchyard belongs to the same geological mass as the Hong Kong eurite, and both these are members of the acid series of igneous rocks—granites, granitites †, eurites and rhyolites—which can be traced from the Island of Hainan, north-east through Hong Kong to Foochow, and are repeated in a parallel band which reaches the sea-coast at Chusan, are repeated in the Korea, and possibly represented again by the central granitic axis of Kamtschatka. These rocks probably belong to one petrographical province and are the relics of a great chain of eruptions which took place in East Asia during middle carboniferous times. The granites and eurites are found intruding into the limestones which occur below the coal-bearing series; whilst fragments of these rocks are the principal constituents of the conglomerates which lie at the base of the coal-measures. The out-crop of these rocks is approximately parallel to the general strike of the stratified series, following the directions of the principal mountain ranges, which in East China Pumpelly has described

* *Quart. Journ. Geol. Soc.*, Vol. XLVII. (1891), pp. 176–178.

† The prevalence of granitite and the occurrence of its representatives amongst the hemicrystalline and felsitic rocks are striking features in these Chinese rocks, and I regard them as a later stage in the eruptions which first gave rise to diorites and andesites—rocks which I have frequently found associated with and included in the later acid eruptions of China.

as the Sinian system of elevation.* Elsewhere I may have occasion to refer to these features in greater detail: for the present I have referred to them for the purpose of showing that, whilst I think the slab found in St. John's Churchyard is undoubtedly of Chinese origin, it may have been brought from any of the localities in East China and Korea where these characteristic, acid, igneous rocks prevail. In what manner the slab was brought to India will doubtless appear from Mr. Hyde's researches.

EXPLANATION OF PLATE.

Figs. 1 & 2. From slab of Chinese agglomerate lava found in St. John's Churchyard.

Fig. 1. Bi-pyramidal crystal of quartz corroded by the magma.

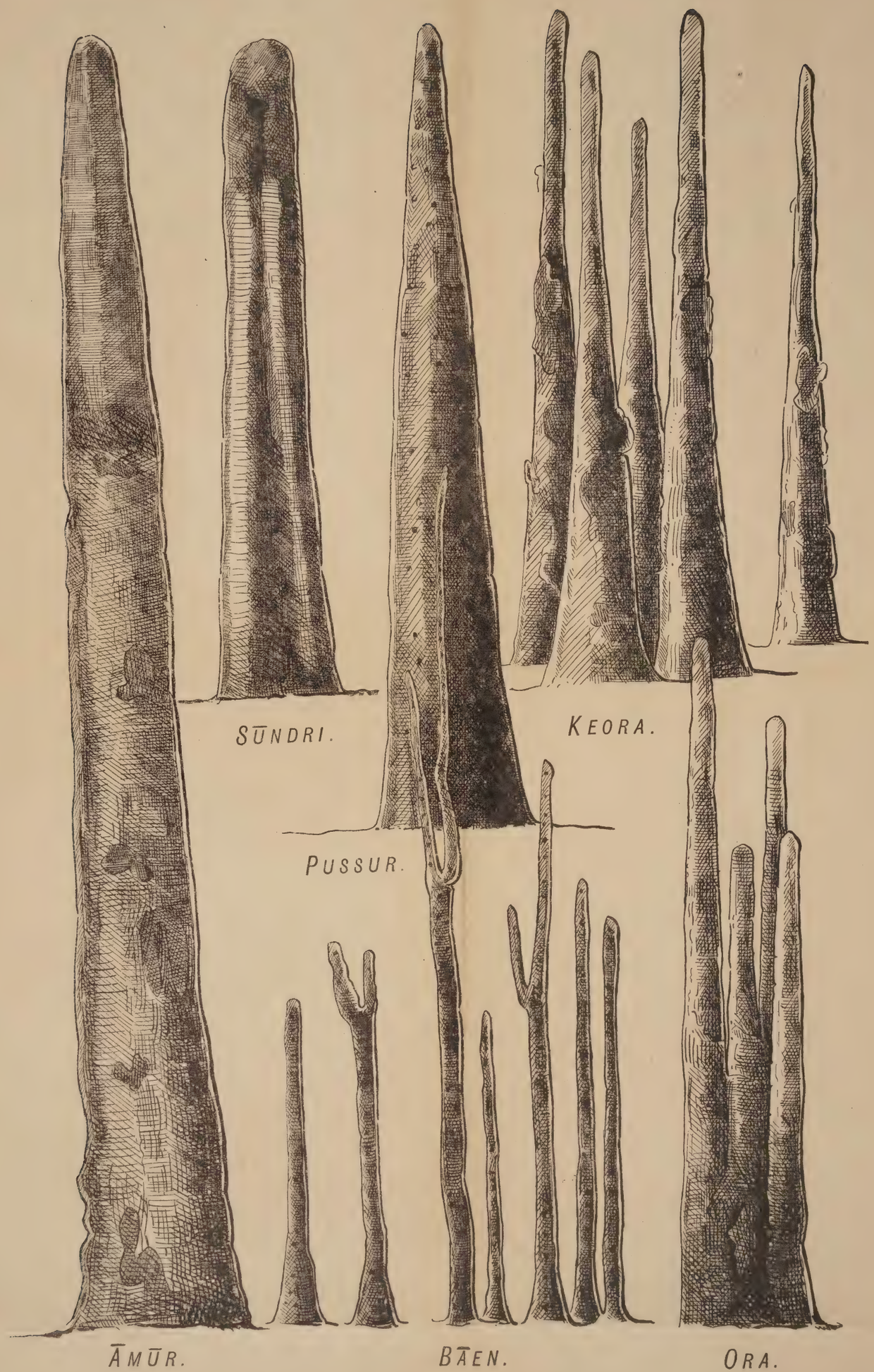
Fig. 2. Crystal cracked and corroded.

Figs. 3 & 4. From eurite. Victoria Peak, Hong Kong.

Fig. 3. Bi-pyramidal crystal of quartz corroded by the magma.

Fig. 4. Crystal cracked and corroded.

* Geological Researches in China, Mongolia, and Japan, 1866, p. 67.



BLIND ROOT-SUCKERS OF THE SUNDERBANS.

HALF NATURAL SIZE.

Drawn by R. L. Heinig, Indian Forest Service.

Fig: 1.

Fig: 2.

Fig: 3.

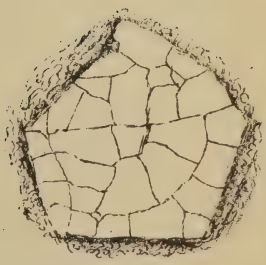


Fig: 4.

JOURNAL

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Vol. LXII. Part II.—NATURAL SCIENCE.

No. IV.—1893.

Natural History Notes from H. M. Indian Marine Survey Steamer, 'Investigator,' Commander C. F. Oldham, R. N., Commanding. Series II., No. 9. *An Account of the Deep Sea Collection made during the Season of* 1892–93.—*By* A. Alcock, M.B., C.M.Z.S., *Superintendent of the Indian Museum.*

With plates VIII. and IX.

[Recd. Nov. 21. Read Decr. 6th.]

The collection here described is a very small one, but the few things obtained are interesting.

Among Coelenterata, *Cerianthus* and *Cyathohelia* do not appear to have been before recorded from the Bay of Bengal: among Echinoderma, *Astroschema* and *Echinolampas*—although the latter has been recorded as a Sind Tertiary fossil: and among fishes *Odontostomus*. All these occur in the present collection.

COELENTERATA.

NEMATOPHORA.

ANTHOZOA ACTINIOMORPHA.

ACTINIARIA.

Family **Cerianthineæ.**

Cerianthus, Delle Chiaje.

1. *Cerianthus tenebrarum*, n. sp.

Elegantly caryophyllaceous in shape.

The body wall is thick, and the characteristic investing sheath is

loose. The oral sphincter is stout. The tentacles of the inner crown are short and number about fifty: those of the outer crown are very long with stout base and long wavy filamentous ending, and number about sixty. The septa with their mesenteric filaments are almost entirely confined to the upper third of the enteric cavity, leaving about the lower two-thirds as a perfectly smooth-walled chamber.

Colour dull madder, the tentacles being lighter and ruddier than the body.

Length, contracted in spirit, 50 mm.

With the exception of a species from the Andaman Reefs, described in J. A. S. B., Vol. LXII., Pt. II., 1893, p. 153, this seems to be the only *Cerianthus* hitherto recorded from India.

From the Bay of Bengal on a muddy bottom at 410 fathoms: bottom-temperature 45.5° Fahr.

MADREPORARIA APOROSA.

Family **Turbinolidæ.**

(1) *Flabellum laciniatum*, Phil., and (2) *Flabellum japonicum*, Moseley, appear to be quite common inhabitants of the muddy bottom of the Bay of Bengal at 400–700 fathoms. And among the corals obtained with them during the past year is a new species of *Rhizotrochus*.

Rhizotrochus, Edw. and Haime.

3. *Rhizotrochus crateriformis*, n. sp., Pl. VIII. figs. 1 and 2.

Corallum low, bowl-shaped, having a small central mamillary pedicular scar, a very thin fragile epithecate wall, and a regular, circular calicular orifice with the lip gently everted.

From the thecal wall, which is marked with close faint costal striæ and with close faint concentric lines of growth, the large cylindrical "rootlets" stand out at a wide angle.

The septa, which are in four complete cycles, with an incomplete fifth, are thin, and have their crests strongly emarginate, so that when the corallum is viewed from above they look something like large pali: their surface is marked with lines of distant, coarse granules, concentric with the curve of the crest. The septa of the first two cycles are approximately co-equal, and all unite at the very bottom of the calice by a few stout cylindrical trabeculæ which form a rudimentary columella: above this they do not encroach very greatly on the calicular space, but leave a clear wide central fossa. The septa of the third cycle are narrow laminæ, those of the fourth are still narrower, and those of the incomplete fifth are merely fine ridges in the upper part of the calicle.

Colour in spirit—both corallum and soft parts—quite white.

The tentacles, which appear to be about ninety in number, are disposed in three concentric series.

Greatest height 22 mm.: diameter of calicular orifice 32 mm.: depth of calicular fossa 16 mm.

From the Bay of Bengal on a muddy bottom at 573 fathoms: bottom-temperature 45·3° Fahr.

Family **Oculinidæ**.

CYATHOHELIA, Edw. and H.

4. *Cyathohelia axillaris* (Ell. and Sol.)

Madrepora axillaris, Ellis and Solander, Nat. Hist. of Zoophytes, p. 153, tab. 13, fig. 5.

Cyathohelia axillaris, Edw. and Haime, Coralliaires II. 110.

A branch of a colony answering to the figure in Ellis and Solander was dredged from a previously unknown coral bank in Lat. 14° 11′ 6″ N., Long. 80° 24′ E. [about 55 miles N. by E. of Madras) in 88 fathoms, bottom-temperature 65° Fahr.

MADREPORARIA POROSA.

Family **Eupsammidæ**.

DENDROPHYLLIA, Edw. and H.

5. *Dendrophyllia nigrescens*, Dana.

Dendrophyllia nigrescens, Dana, Zoophytes, p. 387, pl. 27 (30), fig. 1.

From the same coral bank, at the same depth, several branches of this species were dredged.

ANTHOZOA ALCYONIOMORPHA.

The coral bank in 88 fathoms, N. by E. of Madras, appears to be very rich in *Gorgonacea* and *Alcyonacea*. Unfortunately the dredgings were merely rough dried, without any treatment, so that they reached the Museum denuded and almost valueless. The following genera are recognized:—*Anthogorgia*, *Echinogorgia*, *Acis*, *Gorgonella*, *Juncella*, *Scirpearella*; *Spongodes*.

ECHINODERMA.

ASTEROIDEA.

Family **Archasteridæ**.

PSEUDARCHASTER, Sladen.

1. *Pseudarchaster mosaicus*, Alcock and Wood-Mason.

Pseudarchaster mosaicus, Alcock and Wood-Mason, Ann. and Mag. Nat. Hist., Dec. 1891, p. 432.

A specimen with a span of nearly 200 mm. from 599 fathoms off the Madras Coast.

Family **Astropectinidæ.**

Dipsacaster, gen. nov.

2. *Dipsacaster*, *pentagonalis*, n. sp.

Differs from *Dipsacaster sladeni* (Ann. Mag. Nat. Hist., February, 1893, p. 87, pl. V. figs 3 and 4) in the following particulars:—The disk is relatively larger, and the rays, which are bluntly rounded at the tip, are relatively shorter and broader—the whole form being thus more pentagonal; the relative length of the rays to the radius of the the disk is 2·5 : 1; the paxillæ are larger; on the adambulacral plates the central spine of the paxilliform group is a large distinct spine and not a mere spinelet. Two specimens from the Andaman Sea, 112 fathoms.

Family **Pentagonasteridæ.**

Calliaster, Gray.

3. *Calliaster mamillifer*, n. sp., Pl. VIII. figs. 3 and 4.

Rays 5 R=2·5 to 3r.

Abactinal area covered with sunken circular plates, each bounded by a ring of discoid granules: the mid-radial plates of the disk bear each a great globular mammillated spinelet, as do also, but on a smaller scale, the dorso-central and basal inter-radial plates.

The supero-marginal plates, which are six in number, excluding the terminal, and come in partial contact across the distal third of the rays, have the form of great globules, each surmounted centrally with a nipple-like spinelet: those in the outer third of the ray sometimes bear also one or two granules.

The infero-marginal plates coincide not quite exactly with their fellows of the supero-marginal series: they are long, broad and tumid, and each bears near the suture line with that series, a row or a group of large coarse truncated spinelets.

The adambulacral plates have each a furrow series of four radiating spinelets, and actually a single large coarse truncated spine and rarely a few granules also.

The actinal inter-radial areas are of some size, with large and slightly tumid plates, many of which have one, or very rarely two, large coarse spinelets.

All the marginal, adambulacral, and actinal plates have much the same fringe of discoid granules or squames as the abactinal plates, only it is not so regular.

Anus subcentral.

Madreporite small, circular, radially striated, situated about midway between the margin and the centre.

Colour in spirit, chalky yellow. This singularly beautiful species was dredged in the Andaman Sea, between 270 and 245 fathoms.

Family **Zoroasteridæ.**

ZOROASTER Wyville Thomson.

Fine specimens of (4.) *Zoroaster Alfredi* and (5.) *Zoroaster barathri* (Ann. Mag. Nat. Hist., Feb. 1893, pp. 102, 103), from the Bay of Bengal, 599 fathoms.

OPHIUROIDEA.

Family **Astrophytidæ.**

ASTROSCHEMA, Örst. and Ltk.

1. *Astroschema flosculus*, n. sp., Pl. VIII. fig. 5.

R = 11r – 16r.

The sides and abactinal surface of the disk and arms are covered with granules,—prominent granules and globules being scattered over a finely granular surface, and the actinal surface is covered with an uniform microscopic granulation.

Viewed from the aboral aspect the disk is rotate-corolla-shaped, being deeply depressed in the centre and consisting of five deep cut petaloid lobes, each composed of a pair of radial plates. There are no mouth papillæ or tooth papillæ, but there is a vertical row of five large hastate teeth on each mouth segment.

Rays long, tapering to a lash, simple, and perfectly square in section, the actinal angles of the square being occupied by the series of paired spine-like tentacle scales, and the abactinal angles by series of prominent clumps of globuar granules corresponding to the tentacle scales, this arrangement emphasing the arm joints and giving the arms a regularly beaded appearance.

Genital openings nearly vertical, and traversing nearly the whole depth of the disk.

Mouth tentacles large, the second pair of tentacles without any scale, the third pair with the pairs of scales small.

Colour, in alcohol, grey; in life, blood-red.

From the newly discovered coral bank north of Madras, in 88 fathoms.

ECHINOIDEA.

SPATANGOIDA.

Family **Cassidulidæ.**

ECHINOLAMPAS, Gray.

1. *Echinolampas castanea*, n. sp., Pl. VIII. fig. 6.

Test thick, high, bluntly conical towards the greatly excentric abruptly subacuminate apical system; sub-pentagonal in tumid ambital outline; densely felted with short capillary spines, which are larger

and sparser on the actinal surface, and at the tumid inter-radial peristomial margins form fan-like tufts.

Ambulacra equal, narrow, petaloid abactinally, the poriferous areas of unequal length in the same petal, approaching as if to close, and then again diverging, the pairs of pores set very close together in grooves separated by moniliform ridges: beyond the petals the ambulacra increase considerably in width to the ambitus, whence they taper to the peristome, while the pores become single, distant, and invisible to the naked eye as far as the vicinity of the peristome, where they are again large and double, and are crowded together to form distinct phyllodes.

Inter-radia large, constricted very abruptly at the apical system and gradually at the peristome, being represented at the peristomial margin by a single tumid granular plate.

Both ambulacral and interradial plates closely covered with small scrobiculate tubercles of uniform size and disposition, except in the middle of the actinal surface, where they become a little larger and much more scattered: fine miliary granulation between the tubercles.

Apical system small, very excentric in front: a large central madreporite extending from the right anterior basal: four genital pores.

Peristome situated in the middle of a distinct hollow, excentric in front, transverse, pentagonal, with a distinct floscelle.

Periproct in posterior inter-radium, large, elliptical, transverse, immediately inframarginal, with a valvular operculum formed of three large tuberculated plates.

Colour, yellowish green.

Bay of Bengal, 11 fathoms.

At first sight this species has a strong resemblance to *Echinolampas spheroidalis*, d'Arch and Haime, from the Miocene of Sind and Kuchh; from which it is distinguished at once by the concavity of the actinal surface and by the tumid peristomial margin. The test is also higher in the present species.

Family **Spatangidæ.**

Brissopsis, Ag.

2. *Brissopsis Oldhami*, n. sp., Pl. VIII. figs. 7 and 8.

Test thin, inflated, ovoid, with a faint anterior groove and a strong posterior truncation; abactinally covered with recurved hair-like spines which are largest and densest within the peripetalous fasciole; actinally with similar large spines in the interradii, the ambulacra being almost naked.

All the ambulacra are abactinally petaloid and sunken: in the

anterior petal, which is the longest and narrowest, the pores are small and extremely evenly and closely set, in the other petals the pores are large: beyond the petals the ambulacra are only slightly spiniferous at the ambitus, and are almost or quite naked actinally; and all have small and distant pores; but abactinally the plates of the postero-lateral ambulacra are spiniferous, and the pores of those that are enclosed in the sub-anal fasciole are exceptionally large. Abactinally, as actinally, the inter-radii are very large, with big broad plates that are finely and closely granular abactinally and much more coarsely and distantly granular actinally.

Peristome reniform: the orifice of the mouth is made valvular by the remarkable prolongation forwards of the labrum.

Apical system hardly excentric; the madreporite is large, passing backwards from the right anterior basal and separating the posterior basals and radials and several inter-radial plates; four large genital pores.

Periproct small, vertically pyriform, high up in the posterior truncation, with many plates, of which those at the circumference are the largest.

The peripetalous fasciole is very distinct, being broadest posteriorly. Sub-anal fasciole reniform, largely actinal in position, being far distant from the periproct. Two narrow and inconspicuous fasciolar bands extend up from the sub-anal fasciole, one on each side, to the level of the periproct and are then gradually lost.

The pedicels of the anterior petal are of conspicuous length.

Colour, dull olive-green; fascioles dull madder brown.

Bay of Bengal, 753 fathoms, bottom soft mud; bottom temperature 41·2° fahr.

Lovenia, Ag. and Desor.

3. *Lovenia gregalis*, n. sp., Pl. VIII. fig. 9.

Test thin, broad, flat, cordiform, grooved and deeply excised anteriorly, broadly truncate posteriorly, the ambital margin in front sharp, behind gently rounded. Spinature scanty.

Anterior ambulacrum in the groove, with pores small and inconspicuous except at the peristome, where they are larger: it is practically unmodified throughout its course, from apex to peristome. Lateral petaloid ambulacra with pores almost invisible to the naked eye within the internal fasciole: beyond the internal fasciole the antero-lateral petals are markedly divergent from, while the postero-lateral petals are convergent towards, the sagittal line: the slightly sunken pairs of pores are large and are separated from one another by faint

ridges with minute distant granulation, the interporiferous space is broad and bears several series of granules. Beyond the petals the postero-lateral ambulacra increase greatly, while the antero-lateral decrease somewhat in width.

Inter-radii very large and broad abactinally where the antero-lateral bear each a small patch, and the postero-lateral each a much larger patch, of large deeply scrobiculate perforated tubercles, each surmounted by a long slender recurved recumbent hollow spine. Similar but smaller tubercles, with similar spines, cover the actinal surface rather more densely throughout almost the whole of the broad antero-lateral and postero-lateral inter-radii, and also occur in two small patches, involving both ambulacral and posterior inter-radial plates, in each wing of the sub-anal fasciole.

Peristome situated immediately behind the anterior cleft, semilunar in shape, and followed by a long narrow labrum.

Apical system hardly excentric; the madreporite in the posterior basal.

Periproct in the upper part of the posterior truncation, large, transversely oval, not sunken.

The internal fasciole is remarkable in not crossing the anterior ambulacrum; after skirting the groove in rather more than half of its extent, it gradually fades away on either side, sometimes bending slightly towards the groove, as if to cross, sometimes not. The subanal fasciole is large and dumb-bell shaped, and encloses three pairs of pores on either side.

Colours: brownish green, spines white.

Bay of Bengal, 475 fathoms, bottom brown ooze, bottom temperature 45·5° Fahr.

MOLLUSCA.

The Mollusca that we may now regard as characteristic of the hundred-fathom line in the Bay, were again met with in considerable numbers, namely, *Rostellaria delicatula*, Nevill, *Sigaretus* sp., *Tellina* sp., and *Nucula* sp. At about the same depth (128 fathoms) there were dredged *Phos* sp., *Pleurotoma* sp. prox. *atractoides*, Watson, and *Tellina* sp. prox. *Murrayi*, E. A. Smith, and on the coral bank, at 88 fathoms, *Murex palmarosæ*, Lmk.

ARTHROPODA.

CRUSTACEA.

DECAPODA.

At 128 fathoms the Penæid (1.) *Solenocera Hextii*, Wood-Mason, characteristic of that depth here, was dredged.

Of the other crustacea taken, three appear to be new to the Indian record. They are as follows:—

Family **Trapeziidæ.**

Quadrella, Dana.

2. *Quadrella coronata*, Dana.

Quadrella coronata, Dana, U. S. Expl. Exped., Crust, Pt. I. p. 266, Pl. XVI. figs. 5 a–d.

A single female.

From the Coral Bank north of Madras, 88 fathoms.

Family **Parthenopidæ.**

Parthenope, Fabr.

3. *Parthenope spinosissima*, A. M.-Edw.

Parthenope spinosissima, A.M.-Edw., Notes sur L' Ile de la Réunion Annexe F., p. 8, Pl. XVII;

A large ovigerous female and a small male.

Colour in life reported to be blood-red.

From the Coral Bank north of Madras, 88 fathoms.

Family **Raninidæ.**

Raninoides, Milne-Edwards.

4. *Raninoides personatus*, White MS., Henderson.

Raninoides personatus, Henderson, Challenger Anomura, p. 27, Pl. II. fig. 5.

Numerous specimens from the Bay of Bengal, 31 fathoms.

Family **Homolidæ.**

Hypsophrys, Wood-Mason.

5. *Hypsophrys superciliosa*, Wood-Mason, Ann. Mag. Nat. Hist., March 1891, p. 269.

Several beautiful specimens, both males and ovigerous females, from the Laccadive Sea, 865 fathoms, bottom *Globigerina* ooze, bottom temperature 40° Fahr.

VERTEBRATA.

PISCES.

ACANTHOPTERYGII.

Family, **Trachinidæ.**

Group Trachinina.

Bathypercis, n. gen.

Head large, depressed; body cylindrical, elongate. Cleft of the mouth wide, oblique, with the lower jaw projecting; villiform teeth in

jaws, vomer, and palatines. Eyes large, supero-lateral. Gill-cleft wide; seven branchiostegals; preoperculum armed; four gills; pseudobranchiæ large. Scales ctenoid; lateral line continuous from occiput to caudal fin, its anterior portion armed. Two separate dorsal fins, the first short, the second long, and equal opposite and similar to the anal. Ventrals jugular.

No air-bladder; no pyloric cæca.

1. *Bathypercis platyrhynchus*, n. sp., Pl. IX fig. 1.

General aspect Platycephaloid, with some superficial resemblances to *Callionymus*.

B. 7. D. 6/14. A. 16. C. 12, with numerous rudimentary rays at base. P. circ. 25. V. 1/5. L. lat., from origin on occiput, 50. L. tr., 11.

Head large, broad, depressed, its extreme length, measured from the tip of the projecting mandible to the apex of the prolonged opercular flap is not much less than half the total, caudal excluded. Body elongate, cylindrical, low, and tapering to the large caudal.

The snout is broad, much depressed, and spathulate, resembling the bill of *Bathypterois;* its extreme length is equal to the major diameter of the orbit, and rather over one-fourth the extreme length of the head. Mouth-cleft wide, slightly oblique, the maxilla reaching nearly to the vertical through the middle of the eye, and ending in a fleshy barbel. Teeth in villiform bands on the jaws, vomer, and palatines. Tongue large, spathulate.

The large eyes are placed close together on the summit of the head, separated from each other by a narrow groove; but the visual axis is lateral. The gill-cleft is very wide, the gill-membranes being free of the isthmus throughout: the preopercular angle is spinate, and the operculum, which is prolonged in membrane nearly to the level of the 4th dorsal spine, has two spines above and one below. Four gills with setiform gill-rakers and broad laminæ: pseudobranchiæ large.

The body, and the head and the snout above, are covered with rather large finely ctenoid scales. The lateral line, beginning on the occiput as a close-set row of re-curved spines, or strongly carinated scales, curves inwards towards the first dorsal fin and then downwards along the lower half of the tail, being salient but unarmed in this part of its course.

The first dorsal fin is short, and is separated from the second by four or five rows of scales: the second, which is much more elevated than the first, extends from the level of the vent to within an eye-length of the base of the caudal. The anal fin is similar to the second

dorsal. The pectorals are large and long, reaching to the fourth anal ray. The ventrals are jugular, arising an eye-length in advance of the pectorals: their plane of origin is horizontal, and they reach considerably beyond the scaly bases of the pectorals.

Stomach siphonal with a large cæcal sack. No pyloric cæca. No air-bladder.

Colours in spirit, yellowish-brown, with thirteen incomplete and indefinite darker cross-bands on body and tail: a golden-green ocellus on crown of head and in the apex of each opercular flap: spinous dorsal white at base, black in the upper half; second dorsal with dusky bands: caudal and pectorals dusky: anal and ventrals hyaline. Length 4·3 inches.

Bay of Bengal, 128 fathoms.

Family, **Pediculati.**

Lophius, Art.

2. *Lophius mutilus*, n. sp.

This species is distinguished from all its fellows by the structure of the second part of the spinous dorsal fin, which is rudimentary.

B. 5. D. 3/ (2)/ 8. A. 5. C. 8. P. 15. V. 1/5.

Cephalic disk enormous, its width nearly equal to its length, which is not much less than half the total, including the caudal.

The head bones are marked by spinate crests, one small and bifid at the pre-orbital angle; one large and tridentate above each orbit; one at the upper limit of the clavicle, one large and trifid at the angle of the clavicle, and two on the preoperculum—besides numerous ridges ending in acute points.

The eyes are large, their major diameter being nearly one-fifth the length of the head.

The mouth-cleft involves the whole breadth of the cephalic disk. Small depressible fangs of unequal size in three irregular series in the mandible, in two series at the pre-maxilliary symphysis, but in a single series along the greater extent of the pre-maxilla: a pair of rigid fangs on each side of the vomer: an uneven row of five or six rigid fangs along each palatine. Gill-cleft relatively wide: three gills.

Head and body covered with loose glandular skin, which forms a row of filaments along the edge of the cephalic disk and along the sides of the tail.

Dorsal spines in the form of plain setæ, the first two of which have the usual position close together on the snout, while the third, which is as long as the cephalic disk and nearly twice as long as the second, arises behind the orbit. The second portion of the spinous dorsal is represented by two distant rudimentary rays only visible by

dissection. The soft dorsal, and all the other fins have the usual position.

Colours in spirit, mottled brown, tip of tongue dusky. Length 5·25 inches.

Bay of Bengal, 128 fathoms.

ANACANTHINI.

Family, **Gadidæ**.

Physiculus, Kaup.

3. *Physiculus argyropastus*, n. sp., Pl. IX. fig. 2.

B. 7. D. 8-9/55. A. 57. V. 6.

Head large, broad, depressed, its length a good deal more than one-fourth of the total, caudal included. Height of the compressed body from about half to eleven-nineteenths the length of the head. Snout broad, depressed, rounded, its length equal to the width of the interorbital space and just exceeding the major diameter of the eye. Mouth wide, oblique, with the upper jaw overhanging; the maxilla reaches behind the vertical through the middle of the orbit; broadish bands of villiform teeth in the jaws only. Barbel filiform and inconspicuous, its length not half that of the eye. Gill-openings extremely wide, free from the isthmus throughout: four gills, with about eleven spathulate gill-rakers. Pseudobranchiæ glandular. Body and head invested with small thin deciduous cycloid scales, of which there are six rows between the first dorsal fin and the lateral line.

The first dorsal, which is separated from the second only by a notch, begins in the vertical through the origin of the pectorals; its height is about equal to the length of its base, which is considerably less than one-third that of the head: the second dorsal extends to within an eye-length of the caudal, and its rays, posteriorly especially, are longer than those of the first. The anal begins almost in the vertical through the base of the pectoral, the vent being situated forwards in the vertical through the posterior edge of the operculum. The pectorals are long and pointed, the upper rays reaching to the twelfth or fourteenth anal ray, and being as long as the head behind the middle of the eye. The ventrals arise on narrow horizontal bases: the second ray is nearly as long as the head. There is a post-anal papilla, and a pre-anal pigmented pit, as in *Physiculus roseus*.

The margin of the large thick-walled air-bladdder is pectinately lobed somewhat as in Sciænoids. Colour in spirit, light pinkish brown, with a silvery sheen; belly, throat, and gill-membranes black.

Bay of Bengal, 128 fathoms.

The largest specimen, an adult female, is 9 inches long.

Bregmaceros, Thompson.

4. *Bregmaceros MacClellandii*, Thomps.

A fine specimen from the Bay of Bengal in 128 fathoms.

The small and immature specimens dredged in previous years at and near this depth, probably belong to this species.

Family, **Ophidiidæ.**

Neobythites, Goode and Bean.

5. *Neobythites steatiticus*, n. sp., Pl. IX Fig 3.

B. 8. D. circ. 85. A circ. 65. C. 8. P. circ. 22. V. 2.

The large heavy head is in length about one-fourth of the total, caudal included, and is armed with a large opercular spine. The snout, which is bluntly pointed and overhangs the mouth, is in length equal to the diameter of the eye, or between a fifth and a sixth the length of the head. The eyes are large and prominent, without any orbital fold: they are a little over a diameter apart. The nostrils are large, the anterior being a small tube near the tip of the snout, the posterior being a large foramen at the angle of the eye.

The mouth is large, the maxillary extending far behind the posterior border of the orbit, and being nearly half of the head in length.

Teeth viliform, in narrow bands in the jaws, vomer, and palatines.

Gill-cleft very wide, the gill-membranes being separate throughout. Four gills, with broad laminæ and close-set gill-rakers, which are long in the middle of the first arch.

Each pseudobranch consists of two pinnules only. The head, body, and base of the dorsal and pectoral fins are covered with small, moderately adherent scales, of which there are about nine rows between the first dorsal ray and the lateral line, and about twenty-one rows between the lateral line and the vent. The vertical fins have long delicate rays, which are completely invested in loose skin: the dorsal begins well in advance of the base of the pectoral, and the anal on a level with the tip of the latter, both being confluent with the caudal at its base.

Pectorals with large fleshy scaly base: the ventrals arise on the pectoral symphysis, and consist of two long filaments fused together in their basal half.

Stomach siphonal; intestine much coiled; about eight or nine minute rudimentary pyloric cæca encircle the pylorus.

Colour in spirit, creamy yellow clouded and marbled with shades of light brown which forms four ill-defined cross-bands, all of them involving the dorsal fin: a large oval ocellus, formed of a black centre

in a broad creamy white ring, on the dorsal fin between the 20th and 30th rays or a little beyond: anal jet black with a milk-white border.

Length of type 5·25 inches.

Bay of Bengal, 128 fathoms.

PHYSOSTOMI.

Family, **Scopelidæ**.

ODONTOSTOMUS, Cocco.

6. *Odontostomus atratus*, n. sp., Pl. IX Fig. 4.

The extreme length of the square, high, compressed head is a little more, and the greatest height of the compressed tapering body is a little less, than one-fourth of the total, caudal included.

The snout has the form of a pointed wart beyond which the upper jaw projects, the lower jaw again projecting beyond the upper.

The eyes, which are situated about a diameter apart, near the top of the head, have their major diameter obliquely vertical, and are capable of such strong rotation inwards as to bring the visual axis obliquely upwards, the orbit being walled in laterally by a stout but transparent fold of skin in its lower half.

The cleft of the mouth extends almost to the posterior edge of the operculum: the premaxillæ are armed with a series of close uniform serrations for the most part pointing forwards, the vomer bears on each side a sabre-shaped depressible fang nearly half as long as the head, the palatines have each an exactly similar fang succeeded by a row of close serrations, and the mandible has on each side a distant series of similar fangs of unequal size, the largest of them however being hardly half the length of those on the vomer and palatines.

Gill-cleft extremely wide and high: four gills with wide laminæ and gill-rakers inconspicuous or absent: pseudobranchiæ large.

Body covered with a glandular scaleless skin in which the lateral line appears in spirit as a white streak. Rows of white dots (luminous organs?) exist along the free border of the preoperculum and the inner border of the broad boat-shaped mandible.

The dorsal fin lies altogether within the anterior half of the body: the anal begins about half a head length behind the vertical through the last dorsal ray, and extends to the rudimentary basal rays of the forked caudal. The large pectorals arise close to the ventral profile, almost in the same plane with the ventrals, the bases of which they touch when laid back. The ventrals arise under the middle of the dorsal.

Colour in spirit, jet black.

Length 3·5 inches.

Bay of Bengal, 573 fathoms.

Family **Muræniдæ**.

Congromuræna, Kaup.

7. *Congromuræna squaliceps*, n. sp., allied to *C. megastoma*. Gthr. and *C. longicauda*, Alcock.

Head about an eye-length longer than the trunk, which is not quite one-fourth the length of the tail. The snout, which projects far beyond the mouth, is a little more than one-fifth the head in length. The major diameter of the very elliptical eye is not quite two-thirds of the length of the snout. The anterior nostril is a short wide tube situated on the lip near the end of the snout, the posterior is a wide foramen situated in advance of and above the angle of the eye. The mouth-cleft is wide, extending almost to the vertical through the posterior border of the orbit, and the lips are greatly developed: the minute teeth are in bands in the jaws, and in a broad rasp-like patch outside the mouth in the premaxillary; there are a few teeth on the vomer quite anteriorly. Gill-openings comparatively wide, separate. No scales: lateral line with small pores. Pectorals narrow, half an eye-length longer than the snout. Vertical fins confluent, the dorsal beginning nearly an eye-length in advance of the gill-opening.

Colour in spirit, grey, the vertical fins in their after half to two-thirds with a black edge, which in the anal tends to involve the whole fin. A very large air-bladder extending half a head-length beyond the vent. Visceral peritoneum silvery. A sexually mature male 15 inches long from the Bay of Bengal, 128 fathoms.

8. *Congromuræna nasica*, n. sp. Allied to the preceding group.

Head depressed, an eye-length longer than the trunk, which is much more than a-fourth the length of the tail (1 : about 3·4).

The snout, which projects beyond the mouth, is a fourth the length of the head and nearly twice the major diameter of the eye. The nostrils are as in the preceding species.

The mouth cleft extends almost to the vertical through the posterior border of the orbit. The teeth are in two bands in each jaw, an inner band of minute teeth, and an outer broader band of larger teeth: the premaxillary teeth are in bands outside of the closed mouth, and the vomerine teeth are in a single row along the anterior fourth of the bone.

Gill-openings comparatively wide, separate. No scales: lateral line with minute pores. Pectorals narrow, equal to the snout in length. Vertical fins confluent, the dorsal beginning over the gill-opening.

Colour in spirit gray, the vertical fins in their after third to fourth with a much narrower black edge. Visceral peritoneum black.

Two nearly mature females 10 inches long, and two young from the Bay of Bengal, 128 fathoms. The differences between this species and the preceding are too numerous to support the opinion that they are only different sexes of the same species.

At the same station a specimen of (9.) *Dysomma bucephalus* was dredged.

On some Indian Species of Canarium.—*By* George King, M. B., LL. D., F.R.S., C.I.E. *Superintendent of the Royal Botanic Garden, Calcutta.*

With Plates X, XI, XII, and XIII.

[Read—December 6th]

In Sir Joseph Hooker's Flora of British India eighteen species of *Canarium* are described. Of these, twelve are Indo-Malayan, two have hitherto been collected only in the Andaman Islands, and two are confined to Ceylon. The remaining two, *viz.*, *C. strictum*, Roxb., and *C. bengalense*, Roxb. are natives of British India proper, and were both originally published by Roxburgh in his Flora Indica. *C. strictum* is a native of Southern India, and was originally described from specimens received by Roxburgh from the Forests of the Tinnivelli district in the extreme South of the Peninsula. It has since been collected in the Anamalli and Bababudin Hills, in the Concan, and in other parts of the Forests of the Western Ghats. *C. bengalense*, on the other hand, is known only from Sylhet and Assam. The distribution of the two species is therefore very different. All the species of *Canarium* known to me are large trees with tall clear stems, bearing branches, (and consequently flower and fruit), only at their apices. Botanical specimens are therefore not easily obtained, and the various species are poorly represented in most collections, and are therefore but imperfectly understood by Botanists. The species indigenous to British India proper do not in these respects form any exception; for, in spite of the existence for the last five and twenty years of a large and well-organised Forest Department, we do not appear to know more to-day about them than we did when Roxburgh originally described two of them eighty years ago. With the view of directing the attention of forest officers to their study, I venture to submit to the Society descriptions of the two already recognised Indian species, a description of what appears to me to be a new species from Sikkim, and some notes on specimens which appear to belong to two species hitherto unrecognised and undescribed.

CANARIUM, Linn.

Tall reziniferous trees. Leaves alternate, unequally pinnate, stipulate or exstipulate. *Flowers* bracteate, in panicles or racemes, dimorphous, those with fertile stamens and rudimentary ovaries being smaller but in larger inflorescences, those with fertile ovaries and rudimentary stamens being larger but in smaller inflorescences. *Calyx* campanulate, with 3 valvate lobes or teeth. *Petals* 3, imbricate, longer than the calyx. *Stamens* 6, the filaments united in their lower part to form a tube. *Ovary* 3-celled, ovules 2 in each cell. *Style* cylindric, or stigma subsessile and capitate. *Drupe* ellipsoid, more or less distinctly trigonous, with a 1–3-celled, 1–3-seeded, stone; cotyledons often partite.*

1. C. BENGALENSE, Roxb. Hort. Beng. 49: Fl. Ind. III., 136. Young branches glabrous. *Leaves* 1 to 2 feet long (in young trees considerably more); leaflets 11 to 21, oblong-lanceolate to ovate-oblong, entire, acute, or very shortly acuminate, the base rounded or slightly narrowed; both surfaces glabrous; the main nerves 10 to 20 pairs, subhorizontal, curving at their tips, distinct on the lower surface when dry; length 3 to 7 in., breadth 1·25 to 2·5 in.; stipules subulate, pubescent, deciduous. *Inflorescence* glabrous as to the rachises, the pedicels of the flowers puberulous; the male flowers in racemose panicles, the lateral branches of which are pedunculate few-flowered rather lax cymules. *Calyx* about one-third of the length of the corolla, campanulate, its mouth with 3 shallow broad teeth. *Petals* coriaceous, oblong, concave, glabrous. *Staminal-tube* about the same length as the free part of the filaments and anthers; free part of filament slightly shorter than the narrowly ovate anthers. *Disc* none; rudimentary ovary depressed, deeply lobed, hispid at the apex. *Female flower* (fide Roxburgh) like the male; the ovary ovoid, tapering gradually into the style, the stigma 3-cleft. *Ripe drupe* oblong; the style sub-persistent, tapering to each end, smooth, 1·5 to 1·75 in. long and ·7 to ·8 in. in diam. Hook. fil. Fl. Br. Ind. I, 534; Engler in DC. Monog. Phan. IV, 118.

Assam and Sylhet; Griffith No. 1144. (Kew Distrib.), Simons, S. E. Peal, Mann.

A tall tree like *C. strictum* but, unlike that species, almost entirely glabrous, and having leaves with smaller and more numerous leaflets. According to Mr. S. E. Peal, who has resided and observed in Assam for five and twenty years, its vernacular name in the Sibsagar district of that province is *Neribi*. From wounds in the

* There is no true disc in any of the species here described. What some writers refer to as a disc is merely the tube formed by the union of the dilated lower part of the filaments.

bark a clear amber-like rezin exudes which is used for a variety of purposes, but chiefly to be burnt as incense.

Plate X, *C. bengalense*, Roxb.—1. Two leaflets. 2. inflorescence. 3. ripe fruit; *of natural size.* 4. calyx. 5, 6, 7. petals. 8. staminal column. 9. rudimentary ovary; *enlarged.* 10. two stamens; *much enlarged.*

2. C. STRICTUM, Roxb. Hort. Beng. 49: Fl. Ind. III, 138. Young branches rufous-tomentose. *Leaves* 1 to $1\frac{1}{2}$ feet long (in young trees up to even 4 feet); leaflets 7 to 9, ovate to elliptic, minutely serrate or crenulate when young, entire or sub-entire when adult, shortly acuminate, the base rounded or slightly cordate and sometimes sub-oblique; when young tomentose on both surfaces; when adult the upper surface glabrous and shining, the lower more or less tomentose with the 11 to 16 pairs of spreading rather straight main nerves bold and prominent and the intermediate nerves distinct and parallel; length 3 to 6 in., breadth 1·5 to 2·5 in., petiolule ·25 or ·3 in., that of the terminal leaflet two or three times as long. *Inflorescence* more or less deciduously rusty-tomentose, that of the staminiferous flowers a narrow racemose panicle 6 to 9 in. long, its lateral branches being shortly peduncled few-flowered cymes. *Male* flowers ·35 in. long. *Calyx* tubular, with 3 shallow, broad, sub-acute teeth. *Petals* coriaceous, oblong, concave and pubescent outside in the upper two-thirds, glabrous inside. *Staminal tube* equal in length to the free part of the filaments and the anthers; free part of the filaments dilated towards the base, half as long as the ovate apiculate anthers. *Disc* none. *Rudimentary ovary* short, depressed, lobed, hispid. *Female flowers* ·5 in. long, in few-flowered racemes 4 or 5 inches long. *Calyx* wider than in the male. *Staminal tube* also as in the male, but shorter and the anthers with little or no pollen. *Ovary* ovoid-cylindric, tapering into the short thick style; stigma conical. *Ripe drupe* ellipsoid, tapering more to the apex than to the base, slightly trigonous, glabrous, 1·5 in. long, and ·75 in diam. Wight and Arnot Prodrom., 175: Dalz. and Gibs. Fl. Bombay, 52: Beddome Fl. Sylvat. I, t. 128; Hooker Fl. Br. Ind. I, 534; Engler in DC. Monog. Phan. IV, 118. *Pimela stricta*, Blume Mus. Bot. Lugd. Bat. I, 226.

Peninsular India, in the moist Forests of the Western Ghats up to elevations of 4,000 to 4,500 feet.

A very tall tree, the young leaves of a beautiful red colour, those of young trees or of young shoots of old trees being much larger than the measurements given above. According to Col. Beddome, the flowers have occasionally 4 petals and 8 stamens. The tree is known to Europeans in Southern India (Beddome Fl. Sylv., 128) as "black dammar." Its Tamil name, says the same authority, is *Karapu Kungi-*

liam; but it is also known as *Googal* and *Dhup*, two words which in the Eastern Himalaya are conjoined as the name of the species which I below name *C. sikkimensis*. In S. Canara *C. strictum* is known as *Manda Dhup*. The rezin, which is obtained by the barbarous and destructive method of cutting gashes in the lower part of the stem and then setting it on fire, is an article of trade in Southern India. It is used in the manufacture of bottling-wax, varnishes, &c., and is known by a variety of names of which the commonest are *Dhup*, *Googal*, and *Black dammar*.

Plate XI, *Canarium strictum*, Roxb.—1 and 2. leaflets. 3. inflorescence of male flowers. 4. inflorescence of female flowers. 14. drupe; *of natural size*. 5. calyx of male flower. 6. the three petals of the same. 7. side view of a petal. 8. staminal tube laid open. 12 and 13, pistils; *enlarged*, 10 and 11. front and back view of stamens; *much enlarged*.

3. C. SIKKIMENSE, King, n. sp. Young branches very thick and (like the petioles, petiolules, and under surfaces of leaves) densely rusty-tomentose. *Leaves* 15 to 13 inches long; leaflets ovate or elliptic to oblong, minutely crenate-serrate, shortly acuminate, the base rounded or emarginate, slightly oblique; upper surface (when adult) glabrous, shining; the lower softly tomentose, the 13 to 20 pairs of spreading, rather straight main nerves bold and prominent; length 4 to 7·5 in., breadth 2 to 3·5 in., petiole ·1 to ·25 in. *Male inflorescence* a racemose panicle 9 to 15 in. long, the lateral branches being shortly-stalked few-flowered cymes. *Flowers* ·3 in. long. *Calyx* tomentose outside, glabrous inside, campanulate, cut for one-third of its length into 3 broad, obtuse teeth. *Petals* twice as long as the calyx, oblong, obovate, coriaceous, concave and pubescent externally in the upper two-thirds, glabrous within. *Staminal tube* about half as long as the free part of the filaments and anthers, puberulous inside; free part of the filament nearly as long as the linear-ovate anther. *Rudimentary ovary* depressed, hirsute, lobed. *Disc* none. *Female flowers* unknown. *Ripe drupe* narrowly cylindric, ellipsoid, slightly obovoid, glabrous, sub-trigonous, 1·75 in. long and ·7 in. in diam. *C. bengalense*, (not of Roxb.) Gamble List of Trees of Darjeeling District, 15.

Sikkim, in tropical valleys at elevations of from 1,000 to 3,000 feet.

This is named *Googal Dhup* by the Nepalese, and *Nar-ok-pa* by the Lepchas. It is a very tall tree, and was once very common on the lower hill-forests; but now, alas! it is rare. According to Mr. Gamble (l. c. 15) the wood is white, open-grained and soft, with large medullary rays, and has a low specific gravity. It yields a rezin which is burnt as incense by the Lepchas. This much resembles the Southern Indian *C.*

strictum, Roxb., but differs in having broader leaflets more tomentose beneath, a narrower drupe, and shorter branchlets.

Plate XII. *Canarium sikkimense*, King. 1. Leaflet. 2. inflorescence of male flowers. 3. ripe drupe; *of natural size.* 4. calyx. 5,6, & 7. petals, 8. staminal tube. 9. rudimentary ovary; *enlarged.* 10. stamens; *much enlarged.*

Besides the foregoing species, of which pretty full materials exist in the Calcutta Herbarium, there are imperfect materials of another species from Assam, *viz* :—

C. REZINIFERUM, Brace MSS. in Herb. Calc. A large tree 6 or 8 feet in girth, with leaflets resembling those of *C. sikkimense* in shape and size, but having their under surfaces covered with much less and much minuter tomentum, and with the rachises on which they are inserted almost glabrous. The *male inflorescence* is a panicle of cymes 12 to 16 in. long, the *female inflorescence* being racemose and only half as long, and both being rufous-puberulous. *Drupe* ovoid, 1·5 in. long, and nearly 1 in. in diam. when ripe, glabrous. Male and female flowers unknown. Assam and Khasia Hills, G. Mann.

This is the *Dhoona*, or *Dhua*, tree of Assam, and is a species apparently well enough known by its vernacular name and probably common in that province. It yields a rezin which is used to make torches. Fruiting specimens of it were collected by Mr. Gustav Mann at Nangpoo and at other places in the Khasia Hills. Male inflorescences with a few worm-eaten flowers accompany other specimens sent to the Calcutta herbarium by the same indefatigable collector. Leaf-specimens collected at Jota Bhor (near Jorhat) in the year 1845 by Mr. Masters, (a collector sent from the Garden,) also exist in the Calcutta Herbarium. But perfect specimens of flowers of both kinds are still wanting. Will no Forest officer now collect them ?

Plate XIII. *C. reziniferum*, Brace. 1. Leaflet. 2 inflorescence of male flowers. 3. ripe fruit; *of natural size.* 4. calyx. 5,6, & 7. petals. 8. staminal tube. 9. rudimentary ovary; *enlarged.* 10. two anthers; *much enlarged.*

There also exist in the Calcutta Herbarium specimens in fruit of a species from Arakan with glabrous oblong leaflets 6 or 7 inches long and about 3 inches broad, with minutely serrate edges, acuminate apices and broad emarginate bases, and drupes like those of *C. strictum*, Roxb. The nearest allies of this are apparently (1) *C. bengalense*, which has however smaller leaflets and much narrower drupes; and (2) *C. euphyllum*, Kurz, a species of which the drupe is as yet unknown.

Materials for a Flora of the Malayan Peninsula—*By* George King, M. B., LL. D., F.R.S., C.I.E., *Superintendent of the Royal Botanic Garden, Calcutta.*

No. 6.

Order XX. LINEÆ.

Herbs or shrubs. *Leaves* usually alternate, simple, entire, rarely crenate-serrate; stipules lateral or intrapetiolar or 0. *Inflorescence* various. *Flowers* regular, bisexual. *Sepals* 5, rarely 4, free or connate below, imbricate. *Petals* as many, hypogynous or slightly perigynous, usually fugacious, often contorted. *Stamens* 4–5, with as many interposed staminodes, or 8–10, (rarely more) filaments united at the base into a hypogynous or slightly perigynous ring, filiform; anthers versatile, 2-celled. *Glands* 5, entire or 2-lobed, usually adnate to the staminal ring, or obsolete. *Ovary* entire, 3–5 celled; styles 3–5, free or more or less connate, stigmas terminal; ovules 1 or 2, inserted in the inner angle of the cells, anatropous, pendulous. *Fruit* usually splitting into 3–5 cocci, rarely a drupe. *Seeds* 1–2 in each cell, testa sometimes winged, albumen fleshy or 0; embryo nearly as long as the seed, straight, rarely incurved, cotyledons broad, radicle superior.—Distrib. All regions; genera 14, species about 145.

Petals contorted, fugaceous; perfect stamens 2 or 3 times as many as the petals. Fruit drupaceous. Scandent herbs with hooked lateral branchlets	1 *Roucheria.*
Petals imbricate, with scales on their inner faces, ultimately deciduous; perfect stamens twice as many as the petals. Fruit drupaceous. Shrubs or trees	2 *Erythroxylon.*
Petals contorted, persistent; stamens 2 to 4 times as many as the petals. Fruit capsular, septicidal	3 *Ixonanthes.*

1. Roucheria, Planch.

Erect or climbing trees or shrubs with revolute woody tendrils. *Leaves* quite entire or glandular-serrate, coriaceous, penninerved; stipules minute, caducous. *Flowers* axillary, yellow, subsessile, or in excessively short fascicled spikes; pedicels bracteolate. *Sepals* 5. *Petals* 5, hypogynous, contorted, fugacious. *Stamens* 10, all fertile, filaments connate into a short tube below. *Glands* obsolete. *Ovary* 3–5-celled,

styles 3–5, filiform, stigmas cuneate, 2-lobed ; ovules 2, collateral. *Drupe* scarcely fleshy, subglobose ; stone 3–6-angled, bony, cells 1-2-seeded. *Seeds* compressed, pendulous ; albumen rather fleshy, embryo with foliaceous cotyledons and an elongate radicle.—Distrib. 3 or 4 species, one or more Malayan and 2 from Guiana.

1. Roucheria Griffithiana, Planch. in Hook. Journ. Bot. VI, 143 : VII, 527. A glabrous climbing shrub with hooked lateral branchlets. *Leaves* alternate, lanceolate, oblanceolate or elliptic-lanceolate, rather bluntly caudate-acuminate, obscurely crenate-serrate, the base cuneate ; main nerves faint, 6 to 8 pairs, curving ; length 3 to 5 in., breadth 1·2 to 1·6 in. ; petiole ·35 to ·5 in., slender. *Flowers* ·35 in. in diam., in dense shortly-pedicelled clusters of 7 or 8. *Petals* narrowly oblong, obtuse, very fugaceous, thin. *Drupe* ovoid, ·25 in. long, the pulp thin. Hook. fil. Fl. Br. Ind. I, 414.

In all the provinces except the Andamans and Nicobars. Distrib. Sumatra, Borneo.

2. Erythroxylon, Linn.

Shrubs or small trees, usually quite glabrous. *Leaves* alternate, entire, often subdistichous ; stipules intrapetiolar, often imbricating on short arrested leafless branches. *Flowers* axillary, small, white or pink, solitary or fascicled, peduncles bracteolate. *Sepals* 5, rarely 6, free or connate. *Petals* 5, hypogynous, deciduous, with an erect double ligula on the inner face, imbricate. *Stamens* 10, rarely 12, filaments united into a glandular or eglandular tube. *Ovary* 3- rarely 4-celled ; styles 3, rarely 4, free or connate, stigmas capitate ; ovules, 1, rarely 2 in each cell. *Drupe* 1-celled, 1-seeded. *Seed* with a thin testa, albumen variable in quantity or 0 ; embryo straight, cotyledons plano-convex, radicle short.—Distrib. Species about 50, mostly American, and tropical.

1. Erythroxylon burmanicum Griff. Notul. IV, 468 : Ic. Pl. Asiat. t. 581, f. 3. A glabrous tree 20 to 30 feet high. *Leaves* elliptic or obovate-elliptic, obtuse or slightly emarginate, the base cuneate ; upper surface shining, the lower glaucous, both with open reticulations ; the main nerves about 8 pairs, not more prominent than the secondary ; length 1·75 to 2·5 in., breadth ·75 to 1·25 in., petiole ·2 to ·3 in. *Flowers* in clusters of 2 to 4, their pedicels about ·25 in. long. *Fruit* cylindric-clavate, shining, ·5 in. long ; the calyx and staminal tube sub-persistent. Hook. fil. Fl. Br. Ind. I, 415 ; Kurz For. Fl. Burma I, 171. *E. sumatranum*, Miq. Fl. Ind. Bat. Suppl. 572. *E. retusum*, Bauer ex Teysm. and Binn. in Tijdisch Nat. Ver. Ned. Ind. XXVIII, 71. *Ficus cuneata*, Wall. Cat. 4534.

In all the provinces. Distrib. Burma, Sumatra.

3. Ixonanthes, Jack.

Glabrous trees, often turning black in drying. *Leaves* alternate, entire or crenate-serrate, reticulate; stipules minute or 0. *Flowers* small, in axillary cymose dichotomous peduncled panicles. *Sepals* 5–6, shortly connate at the base. *Petals* 5–6, perigynous, contorted, persistent, hardened round the fruit. *Stamens* 10–20, inserted on the outside of a perigynous annular or cupular eglandular disk. *Ovary* free, 5-celled, cells perfectly or imperfectly 2-locellate; style simple, stigma capitate, lobed; ovules 10. *Capsule* coriaceous or woody, oblong or conic, more or less perfectly 10-celled, septicidal, carpels opening inward. *Seeds* winged or crowned with a mitriform aril, albumen fleshy; embryo lateral, cotyledons foliaceous, radicle superior.—Distrib. Species 3–4, chiefly Malayan.

Leaves oblong-oblanceolate to obovate-oblong, petals ·2 in. long. Capsules ·7 in. long, imperfectly 10-celled	1 *I. icosandra.*
Leaves elliptic to elliptic-rotund, not obovate; petals ·3 in. long. Capsules 1·35 to 1·75 in. long, almost completely 10-celled ...	2 *I. reticulata.*

1. Ixonanthes icosandra, Jack Mal. Miscel. II, No. 7 p. 53: Hook. Comp. Bot. Mag. I, 154. A tree 30 to 40 feet high. *Leaves* coriaceous, oblong-oblanceolate to obovate-oblong, the apex blunt or much rounded; the edges entire, obscurely serrate or crenate, the base cuneate: main nerves spreading, sub-horizontal, faint, about 10 to 12 pairs: length 2·5 to 5·5 in., breadth 1 to 2·5 in., petiole ·25 to ·5 in. *Cymes* on slender peduncles, many-flowered. *Flowers* ovoid, ·2 in. long, scarcely opening; petals broadly elliptic: stamens 12 (usually), the filaments much longer than the petals. *Capsule* narrowly ovoid, ·7 to ·8 in. long, 5-valved, imperfectly 10-celled. *Seeds* 10, on elongated podosperms. Hook. fil. Fl. Br. Ind. I, 416; Miq. Fl. Ind. Bat. i., pt. 2, 494. *I. dodecandra*, Griff. Plant. Cantor 12. *I. cuneata*, Miq. Fl. Ind. Bat. Suppl. 484 and Hook. fil. Fl. Br. Ind. I, 416. *I. obovata* Hook. fil. Fl. Br. Ind. I, 417. *Gordonia? peduncularis*, Wall. Cat. 4409. *Hypericinea dentata*, Wall. Cat. 4832. *Pierotia lucida*, Blume Mus. Bot. i. 180. *Brewstera crenata*, Roem. Synops. i. 141. *Macharisia icosandra*, Planch. MSS. *Ixonanthes sp.* Griff. Notul. iv. 498; Ic. Pl. Asiat., t. 589, f. 2.

In all the provinces except the Nicobars and Andamans; very common.

This is rather a variable plant as to leaves, and to two of the forms specific names have been given. I cannot, however, discover any tangible differences in the flowers or fruit, so I have treated all the forms

as belonging to Jack's *I. icosandra*. The fruit is only imperfectly 10-celled in this species, the vertical processes from the back walls of the cells of the capsule being incomplete. In the next species they are nearly quite complete, and its capsules are really 10-celled.

2. Ixonanthes reticulata, Jack in Mal. Miscel. II, No. 7, 51; Hook. Comp. Bot. Mag. I. 154. A small tree, occasionally only a shrub. *Leaves* coriaceous, not black when dry, elliptic, sometimes elliptic-rotund, the apex blunt, the base cuneate; main nerves 7 or 8 pairs, slightly prominent when dry, interarching ·25 in. from the edge; length 3·5 to 5 in., breadth 2 to 2·75 in., petiole ·6 to ·8 in. *Cymes* on stout peduncles, few-flowered. *Flowers* ovoid to ovoid-rotund, scarcely opening, ·3 in. long, petals broadly elliptic; stamens about 10, the filaments much longer than the petals. *Capsule* 1·35 to 1·75 in, long, 5-valved, 10-celled. Hook. fil. Fl. Br. Ind. I, 417; Griffith Plant. Cantor, 11. *Hypericinea macrocarpa*, Wall. Cat. 4833. *Gordonia decandra*, Roxb. Fl. Ind. ii., 573; Wall. Cat. 4408.

In all the provinces except the Nicobar and Andaman Islands. Distrib. Sumatra.

In this species the 5 cells of the fruit are converted into 10 by a dissepiment springing from the wall of each valve. I have never seen the seeds, all the capsules I have met with being empty.

Order XXI. MALPIGHIACEÆ.

Trees or shrubs, often climbing. *Leaves* (in the Indian genera) opposite, quite entire; stipules small or 0. *Inflorescence* axillary or terminal; pedicels articulate, usually 2-bracteolate. *Flowers* middling-sized or small, white or yellow, more rarely red, yellow, or blue, hermaphrodite, regular or irregular. *Calyx* usually 5-partite; segments imbricate or valvate, 1 or more (never all) furnished with a large gland, rarely eglandular (*Aspidopterys*). *Petals* 5, clawed or not, often fimbriate, imbricate. *Disc* obscure. *Stamens* 10, hypogynous or subperigynous, equal, or 1 or more much larger than the others, filaments free or connate below, anthers 2-lobed. *Ovary* 3-celled; styles 1–3, rarely 4, straight or circinate, stigmas capitate or punctiform or lateral; ovules solitary in each cell, micropyle superior, raphe ventral. *Fruit* (in all the Asiatic genera except *Brachylophon*) of one or more winged samaras. *Seed* exalbuminous; embryo straight or curved, radicle superior.—Distrib. An order, largely represented in America, but scantily in Asia; genera about 50, species about 620.

Styles 1 rarely 2; calyx glandular.

Fruit of 3, united, many-winged samaras ... 1. *Tristellateia.*

Fruit usually of a single 3-winged samara ... 2. *Hiptage.*

Styles 3 rarely 4; calyx eglandular.
Samaras with large membranous reticulate wings ... ... 3. *Aspidopterys.*
Fruit of 2 or 3 turgid almost wingless cocci 4. *Brachylophon.*

1. Tristellateia, Thouars.

Woody climbers. *Leaves* opposite or whorled; petiole 1–2-glandular at the apex; stipules minute. *Flowers* yellow, in terminal or lateral racemes. *Calyx* 5-partite, eglandular, or with minute glands. *Petals* 5, clawed. *Stamens* 10, all perfect; filaments rigid, truncate and articulate at the top, anthers acute. *Ovary* 3-lobed; styles 1–2, slender, one or more reduced to small papillæ. *Ripe carpels* 3, each with about 3 or more wings, the whole forming a stellate fruit. *Seed* obovoid, testa membranous; cotyledons fleshy, hooked.—Distrib. About 8 species, natives of tropical Africa, Asia, and Australasia.

1. Tristellateia australasica, A. Rich. Sert. Astrol. 38 t. 15. Glabrous; *leaves* elliptic, ovate, or oblong, acute, the base cuneate or rounded; main nerves 4 or 5 pairs, forming wide arches far from the margin, faint; length 1·75 to 3·5 in., breadth ·75 to 1·25 in., petiole ·25 to ·35 in., eglandular or with only one gland. *Racemes* 2 to 6 in. long, few-flowered, terminal. *Flowers* 1 in. in diam., their pedicels opposite, minutely 2-bracteolate towards the base. *Petals* ovate. *Fruit* ·5 in. in diam., its wing linear-oblong, coriacious, recurved or spreading. Hook. fil. Fl. Br. Ind. I, 418; Benth. Flor. Austral. I. 286. *Platynema laurifolium*, W. & A. in Edin. New Phil. Journ. 1833, 179; Prodr. 107.

Singapore; Wight, Kurz, Anderson. Pangkore, Scortechini. Pahang, Ridley. Distrib.—Malayan Archipelago, Australasia.

2. Hiptage, Gærtner.

Climbing or suberect shrubs. *Leaves* opposite, quite entire, coriaceous, eglandular, or with a row of remote intramarginal glands beneath; stipules 0. *Racemes* terminal or axillary, simple or compound; peduncles erect, bracteate, jointed to the 2-bracteolate pedicels. *Calyx* 5-partite; glands adnate to the pedicel, large. *Petals* 5, clawed, unequal, white, the odd one discoloured. *Stamens* 10, all fertile, declinate, one much larger than the others; filaments connate at the base. *Ovary* with 3 appendiculate lobes; styles 1 or 2 bearing stigmas, the others rudimentary, all circinate. *Fruit* winged. *Seed* sub-globose, the cotyledons unequal, thick. Distrib: four tropical Asiatic species.

Main nerves of leaves about 4 pairs, inflorescence tomentose or sericeous, flowers ·35 to ·5 in. in diam ... ... 1. *H. sericea.*

Main nerves of leaves 4 to 6 pairs, inflorescence adpressed-pubescent; flowers ·75 to 1 in., in diam. ... ... 2. *H. madablota.*

1. Hiptage sericea, Hook. fil. Fl. Br. Ind. I, 419. A woody climber, the branches and inflorescence more or less covered with soft brown, villous pubescence; lateral branchlets slender, short. *Leaves* elliptic-ovate or oblong, acuminate, glabrous; main nerves about 4 pairs, ascending; length 2 to 6 in., breadth ·9 to 3 in., petiole ·25 in. *Racemes* 2 to 3·5 in. long, axillary and terminal, sometimes much crowded, minutely tomentose or sericeous, many-flowered. *Flowers* ·35 to ·5 in. in diam., pedicels thickened at the apex, ·25 to ·5 in. long. *Petals* clawed, the odd one much lobed, all more or less villous especially externally; central wing of carpel oblanceolate obtuse, with a central ridge near its base, 1·5 to 2 in. long, the lateral much smaller. *H. parviflora*, Wight Cat. 358. *Clerodendron sericeum*, Wall. Cat. 1814.

Penang: Wallich, King's collector, No. 1454. Singapore, Ridley. Pahang, Ridley No 2386. Malacca, Griffith, Derry. Maingay, (Kew Distrib.) No. 272. Perak, King's collector No. 4097.—Distrib. Burmah. Gallatly, No. 890.

This is a very variable plant as to leaves, some of the forms having narrowly oblong, while others have broadly elliptic leaves; the nervation is, however, alike in all. As regards vestiture there is also variation, the inflorescence being in some villous, in others minutely tomentose or pubescent. This must come very near, if it be not actually identical with, *H. javanica*, Blume. The Burmese form of this species has not only narrowly oblong leaves, but racemes 6 inches long and more slender than in Malayan specimens. I propose to name it var. *longe-racemosa.*

2. Hiptage madablota, Gærtn. Fruct. II, 169, t. 116. A glabrous woody climber, the young parts and inflorescence hoary or adpressed-tomentose, the branches stout. *Leaves* coriaceous, ovate-lanceolate, oblong or ovate-oblong, acute or shortly acuminate, the base rounded or cuneate, both surfaces glabrous: main nerves 4 to 6 pairs, oblique, slightly prominent beneath; length 4·5 to 6 in., breadth 1·5 to 3 in., petiole ·25 to ·4 in. *Racemes* 1 to 6 in. long, axillary, sometimes leafy, adpressed-pubescent. *Flowers* ·75 to 1 in. in diam., fragrant. *Sepals* obtuse, less than half as long as the petals. *Petals* fimbriate, the odd one dashed with yellow. *Fruit* with three coriaceous spreading wings, the middle one oblanceolate, obtuse, 1 to 2 in. long, the 2 lateral linear and half as large. Hook. fil. Fl. Br. Ind. I, 418; Kurz For. Flora Burma I, 173; Miq. Fl. Ind. Bat. I, Pt. 2, 585; DC. Prod. I, 583; W. and A. Prod. 107; Wight Ill. t. 50. *Molina racemosa*, Lamk. Dict. IV. 227; Cav. Diss. IX. t. 263. *Gærtnera racemosa*, Roxb. Cor. Pl. I. t. 18; Fl. Ind. II, 368.

Banisteria bengalensis, Linn. *B. unicapsularis*, Lamk. *B. tetraptera*, Sonnerat Voy. II, t. 135. Rheede Hort. Malab. VI, t. 59.

In all the provinces. DISTRIB. British India, China, Malayan Archipelago.

3. ASPIDOPTERYS, A. Juss.

Shrubs, usually climbing. *Leaves* opposite, eglandular, quite entire; stipules 0. *Flowers* in simple or compound axillary and terminal panicles; peduncles bracteate, jointed at the top, pedicels often minutely 2-bracteolate. *Flowers* small, yellow or white. *Calyx* short, 5-partite, eglandular. *Petals* 5, not clawed, spreading or reflexed, quite entire. *Stamens* 10, all perfect, filaments connate or distinct at the base. *Ovary* 3-lobed, lobes flattened at the back, sides winged; styles 3, glabrous, stigmas capitate. *Fruit* of 1–3 samaras; nucleus sometimes crested or winged at the back, and surrounded with a broad oblong or orbicular wing. *Seeds* oblong, subterete; embryo, straight, cotyledons equal, radicle short.—DISTRIB. Species about 15; all tropical Asiatic.

Leaves ovate or obovate, more or less orbicular; panicles slender, lax, with short few-flowered lateral branches: samaras ovate, narrowed and retuse at the apex ... 1 *A. concava.*

Leaves ovate or elliptic, narrowed upwards, not orbicular; panicles spreading, the branches umbellate, many-flowered: samaras orbicular ... ... 2 *A. Helferiana.*

1. ASPIDOPTERYS CONCAVA, A. Juss. in Archiv. Mus. Hist. Nat. III, 509. A climber; young shoots rusty-puberulous, soon becoming glabrous. *Leaves* ovate-elliptic or elliptic, bluntly and shortly acuminate, the base rounded or very slightly narrowed: both surfaces glabrous, the lower minutely dotted when young; main nerves 4 to 6 pairs, curving, ascending; length 3 to 4·5 in., breadth 1·5 to 2·3 in., petiole ·5 to ·65 in. *Flowers* in spreading lateral umbellate panicles. *Samaras* orbicular, membranous, pale, reticulate, the veins radiating, the nucleus winged, about 1·25 in. in diam; their pedicels slender, minutely bracteolate, often 1·5 in. long. Hook. fil. Fl. Br. Ind. I, 420; Kurz For. Flora Burmah, I, 175. *Hiraea concava*, Wall. Pl. As. Rar. I, 13; Cat. 1061. *H. merguensis*, Wight. Ill. I, 139.

Penang; Curtis No. 138, 798. DISTRIB. Burmah.

2. ASPIDOPTERYS HELFERIANA, Kurz Journ. As. Soc. Bengal, Pt. 2, (1874), 137, 184; For. Flora Burma, I., 176. A climber, the young shoots tawny-pubescent. *Leaves* membranous, orbicular-ovate to orbicular-obovate, the apex shortly cuspidate, the base rounded or slightly

cordate, glabrous; main nerves 4 or 5 pairs, curved, ascending; length 3 to 5·5 in., breadth 2·5 to 5 in.; petiole ·5 to ·65 in., puberulous or glabrescent. *Panicles* axillary or terminal, slender, lax, rusty-puberulous when young, the lateral branches distant, few-flowered; ovary quite glabrous, lobes of disc scarcely rugose. *Samaras* ovoid, narrowed towards the retuse apex, membranous, pale brown, with many radiating nerves, reticulate, glabrous, 1 in. or more in length, nucleus with oblong wing. *Hiraea indica* (?) Wall. Cat. 1057.

Andaman Islands. Distrib. Burmah.

The type of this species is one of the things included under Wall. Cat. 1057, with which the Andaman specimens in the Calcutta Herbarium agree very well. Kurz has however also referred to this species certain Burmese specimens, *viz.*, Falconer's No. 72 (from Upper Weingo Valley) and Helfer's No. 923, which, although agreeing with each other, hardly agree with the Wallichian No. 1057 from Neidann. By the way! this sheet from Neidann is not included in Wallich's lithographed and published list.

4. Brachylophon, Oliver.

Glabrous shrubs. *Leaves* opposite, entire. Inflorescence terminal, racemose or corymbose, bracteolate. *Flowers* yellow. *Calyx* 5-partite, eglandular. *Petals* 5, imbricate in bud. *Stamens* 10, all perfect, the alternate shorter; filaments longer than the anthers, flat, conjoined at the base into a short disc: anthers linear, basifixed, opening by 2 apical pores. *Ovary* deeply 3–4-lobed, 3–4-celled; *Styles* 3 or 4, elongate, slender, divergent: ovules solitary in each cell, pendulous, anatropous. *Fruit* usually 3-, sometimes only 2-lobed; separating when ripe into turgid cocci; each coccus keeled along the back, and at the apex produced into a very short wing. *Seed* unknown. Distrib. Three species; all Malayan.

Rachides of the racemes ·5 in. long or less, leaves coriaceous ... ... 1 *B. Hullettii.*

Rachides of the racemes 2 in. or more in length.

Main nerves of leaves 7 to 8 pairs, oblique 2 *B. Curtisii.*

Main nerves of leaves 13 to 15 pairs, sub-horizontal ... ... 3 *B. Scortechinii.*

1. Brachylophon Hullettii, King. n. sp. *Leaves* coriaceous, shining, minutely reticulate, narrowly elliptic, shortly and abruptly acuminate or acute, the base cuneate: main nerves 10 to 12 pairs, rather prominent beneath, sub-horizontal, interarching far from the margin; length 4 to 7 in., breadth 1·8 to 2·5 in., petiole ·1 in. *Racemes* terminal, the

rachis less than ·5 in. long, 4-to 8-flowered; pedicels ·75 in. long, bracteolate at the base. *Sepals* ovate, blunt.

Malacca: on mount Ophir, Hullett.

An imperfectly known plant, easily distinguished from both the other species by its much shorter racemes and more coriaceous leaves.

2. Brachylophon Curtisii, Oliver in Hook. Ic. Plantar. t. 1566. A shrub 3 to 6 feet high. *Leaves* membranous, narrowly elliptic to ovate-rotund, acuminate, the base cuneate; upper surface glabrous, the lower scaberulous; main nerves 7 or 8 pairs, not much more prominent than the intermediate, oblique, interarching ·15 in. from the edge; length 3·5 to 7 in., breadth 2 to 2·25 in., petiole ·1 in. *Racemes* corymbose, 1 to 2 in. long. *Flowers* ·75 in. in diam.; pedicels slender, ·8 to 1·2 in. long, bracteolate at the base. *Petals* yellow, oblong, obtuse, entire, shortly clawed, ·5 in. long. *Ripe fruit* ·35 to ·5 in. long, ·25 in. broad.

Penang: Curtis No. 231.

3. Brachylophon Scortechinii, King, n. sp. A shrub 3 to 6 feet high. *Leaves* membranous, oblong-lanceolate to oblong-elliptic, sometimes oblong-oblanceolate, tapering from the middle to each end, both surfaces glabrous: main nerves 13 to 15 pairs, rather faint, sub-horizontal, interarching ·15 to ·2 in. from the edge: length 5 to 11 in., breadth 2 to 4 in., petiole ·15 in. *Racemes* corymbose, terminal and axillary, 2 to 3 in. long, many-flowered, the rachis tuberculate. *Flowers* about ·6 in. in diam.; pedicels slender, ·65 to 1 in. long, bracteolate at the base. *Calyx-teeth* oblong, obtuse, puberulous, the edges ciliolate. *Petals* ovate, obtuse, entire, glabrous, ·5 in. long. *Filaments* flattened, unequal but all much longer than the petals. *Ovary* 3- to 4-lobed, or 3- to 4-celled: styles 3 or 4, as long as the filaments, spreading, cylindric. *Fruit* unknown. *Ryssopteris elliptica*, Scortechini MSS.

Perak: Scortechini, Wray, King's collector.

I have not seen fruit of this. In its flowers it closely resembles *B. Curtisii*, Oliver, but its leaves are larger, more membranous, and have more numerous nerves than those of *B. Curtisii*.

Order XXII. GERANIACEÆ.

Herbs, undershrubs, or rarely trees; glabrous or more usually pubescent and glandular. *Leaves* opposite or alternate, usually 2-stipulate. *Peduncles* usually solitary and axillary, 1- or more flowered. *Flowers* umbelled, cymose or racemose, usually showy, hermaphrodite, regular or irregular. *Sepals* 5, rarely 4 or 2, free or united to the middle, imbricate or rarely valvate, the posticous sometimes spurred. *Petals* as many as the sepals or fewer by suppression, or 0, hypogynous or subperigynous, variously imbricated, rarely contorted. *Torus* scarcely

expanded into a disc, with 5 glands alternating with the petals, or without glands, raised in the centre into a beak, rarely flat. *Stamens* as many as, or double, or treble the sepals, or fewer by suppression; filaments filiform or dilated, or connate into a ring; anthers 2-celled; cells parallel, opening lengthwise. *Ovary* 3–5-lobed, 3–5-celled, rarely 2-lobed, of 3–5-carpels, united with the axis as far as the insertion of the ovules, sometimes lengthened into a beak-bearing style or styles, which are free or more or less united; stigmas capitate, linear or ligulate; ovules 1 or 2 or rarely more, horizontal or pendulous or ascending. *Fruit* capsular, 3–5-lobed, lobes 1-seeded, often separating from the axis, septicidal or loculicidal, rarely berried. *Seeds* pendulous or horizontal, albumen 0, or scanty or fleshy; embryo straight or curved; cotyledons flat, convex or variously folded, foliaceous or thick or fleshy; radicle either short and near the hilum, or longer and inflected, or incumbent on the cotyledons.—Distrib. Genera 20, with about 800 species, chiefly inhabiting temperate climates.

Oxalideæ.—Leaves compound, flowers regular.

Herbaceous.

Leaves 3-foliolate ... ... 1. *Oxalis.*

Leaves pinnate ... ... 2. *Biophytum.*

Woody.

Shrubs or trees, not scandent, fruit probably indehiscent ... ... 3. *Connaropsis.*

Scandent shrubs, fruit certainly dehiscent 4. *Dapania.*

Balsamineæ.—Leaves simple, flowers irregular.

Lateral petals connate in pairs, fruit capsular. 5. *Impatiens.*

Lateral petals free: fruit drupaceous ... 6. *Hydrocera.*

1. Oxalis, Linn.

Acid herbs, rarely shrubby. *Leaves* radical or alternate, stipulate or ex-stipulate, compound, usually 3-foliolate. *Flowers* on axillary, 1- or more flowered peduncles, regular. *Sepals* 5, imbricate. *Petals* 5, hypogynous, contorted. *Glands* of the disc 0. *Stamens* 10, free or united at the base, all anther-bearing. *Ovary* 5-lobed, 5-celled; styles 5, distinct; stigma terminal, captitate, 2-fid or laciniate: ovules 1 or more in each cell. *Capsule* with loculicidal dehiscence, valves persistent to the axis. *Seeds* with an outer fleshy coat which bursts elastically, testa crustaceous, albumen fleshy, embryo straight.—Distrib. Species about 200, chiefly tropical and temperate S. American and S. African.

1. Oxalis corniculata Linn. DC. Prod. I, 692. A diffuse, creeping, adpressed-pubescent herb with long-petioled 3-foliolate, stipulate

leaves; the leaflets obcordate, the stipules adnate to the petiole. *Flowers* sub-umbellate on 2- to many-fid, setaceously bracteolate peduncles. *Sepals* obtuse. *Petals* obcordate, yellow. *Fruiting pedicels* often depressed. *Capsules* sub-cylindric, tomentose, many-seeded. *Seeds* transversely striate. Hook. fil. Fl. Br. Ind. I, 436; Miq. Fl. Ind. Bat. I, pt. 2. p. 135; Boiss. Fl. Orient. i., 866; Wall. Cat. 4347; Roxb. Fl. Ind. ii. 457; W. & A. Prodr. 142. *O. repens*, Thunb; Wight Ic. t. 18; Blume Bijdr. 243. *O. pusilla*, Salisb.; Roxb. l.c.

Perak: by the sides of damp foot-paths near the bases of the hills. Penang: on Government Hill, Curtis.

2. Biophytum, De Cand.

Annual, rarely perennial herbs, with simple or branched stems. *Leaves* abruptly pinnate, fascicled or almost whorled at the top of the stem; leaflets opposite, oblique; petiole swollen at the base. *Peduncles* terminal, pedicels umbelled. *Flowers* small, yellow, or white. *Sepals* 5, lanceolate, acuminate. *Petals* 5. *Stamens* 10; filaments free, 5 outer smaller. *Styles* 5, stigmas notched at the apex or 2-fid. *Capsule* ovoid or oblong, or subglobose, splitting loculicidally sometimes to the base into 5 spreading valves. *Seeds* as in *Oxalis*.—Distrib. Tropical Asia, Africa, and America. Species about 20.

Leaflets 8 to 20 pairs, equal-sided, glabrous, their bases truncate, slightly oblique: flower-pedicels usually shorter than the sepals, petals yellow ... ... 1. *B. sensitivum.*

Leaflets 18 to 25 pairs, unequal-sided, sparsely hispid on upper surface, their bases obliquely truncate; flower-pedicels longer than the sepals, petals white... ... ... 2. *B. adiantoides.*

1. Biophytum sensitivum, DC. Prod. I, 690. Stem 4 to 10 in. long, hispidulous, erect or decumbent, bearing at its apex 8 to 20 pinnate leaves 1·5 to 5 in. long; leaflets 6 to 15 pairs, the lower pairs oblong, the upper pair obovate-oblong, the apices of all obtuse, sometimes mucronate, the bases truncate, subequal, glabrous, ·25 to ·5 in. long. *Peduncles* variable in length, sometimes nearly as long as the leaves, puberulous, each bearing at its apex a bracteolate umbel of 10 or 12 flowers; bracteoles setaceous, as long as the flower pedicels, pedicels pubescent, as long as the sepals. *Petals* yellow. Hook. fil. Fl. Br. Ind. I, 436; Roxb. Fl. Ind. II, 457; W. and A. Prod. 162; Bot. Reg. XXXI, t. 68; Wall. Cat. 4343 C. E.

Malacca: Griffith. Penang, on the coast, Curtis; and probably in the other provinces.

2. Biophytum adiantoides, Wight ex Hook. fil. Fl. Br. Ind. I, 437. Stem from 6 to 12 in. high, erect or decumbent, pubescent, bearing at its apex 10 or 12 pinnate leaves 4 to 7 in. long; leaflets 18 to 25 pairs, oblong, obtuse, unequal-sided, the apex mucronate, the base obliquely truncate, sometimes auriculed at the upper margin, sparsely strigose on the upper surface. *Peduncles* more than half as long as the leaves, pubescent, each bearing at its apex a densely bracteolate umbel of 6 to 12 flowers; bracteoles short, setaceous: flower-pedicels slender, puberulous, longer than the sepals. *Petals* white, the claws yellow.

Perak: on the banks of the Kamha river, King's collector, No. 931; on the Plus river, Wray No. 3363. Goping, Scortechini, No. 1999. Distrib. Burmah.

3. Connaropsis, Planch.

Trees or shrubs. *Leaves* pinnately 1–3-foliolate; leaflets coriaceous, quite entire, strongly nerved, triple-nerved at the base, margined. *Flowers* minute, regular, in terminal and axillary panicled cymes. *Sepals* 5, imbricate, connate at the base. *Petals* 5, imbricate. *Glands* 0. *Stamens* 10, filaments united at the base, the alternate shorter. *Ovary* 5-angled, 5-celled; styles 5, subulate, more or less united below, stigmas apiculate; ovules 2 in each cell. *Fruit* fleshy, 5-lobed or 5-angled with succulent epicarp and fibrous endocarp, 1- or 2-celled and 1- or 2-seeded by abortion, indehiscent. Distrib. Five species, all Malayan.

Leaves 3-foliolate	1. *C. Griffithii.*
Leaves 1-foliolate.	
Leaves 2 to 3·5 in. long	2. *C. monophylla.*
Do. 6 to 12 in. long	3. *C. macrophylla.*

1. Connaropsis Griffithii, Planch. in Hook. fil. Fl. Br. Ind. 440. A small tree; young shoots glabrescent, dark-coloured when dry. *Leaves* pinnately trifoliolate, coriaceous, glabrous; leaflets elliptic-lanceolate, acuminate, the base cuneate; main nerves 4 pairs, ascending: length 2 to 3·5 in., breadth ·5 to 1 in., petiolule ·15 in. *Panicles* terminal, minutely ferruginous-tomentose, 1·5 to 2 in. long. *Fruit* unknown.

Malacca: Griffith, No. 1667. Maingay (Kew Distrib.), No. 274.

2. Connaropsis monophylla, Planch. Hook. fil. Fl. Br. Ind. I., 440. A shrub or small tree; young shoots minutely ferruginous-pubescent. *Leaves* 1-foliolate, coriaceous, glabrous, ovate, acuminate, the base rounded or sub-cuneate: main nerves about 6 pairs, faint; length 2 to 3·5 in., breadth ·8 to 1·5 in.; petiole ·6 to ·8 in., thickened and pointed towards the apex. *Panicles* terminal or lateral, 2 to 4 in. long, ferruginous-tomentose; the branches erect and spike-like; flowers

crowded. *Fruit* ovoid, glabrous, obtusely 5-angled and furrowed, ·3 in. long.; endocarp fibrous, sarcocarp fleshy.

Malacca; Griffith No. 947; Maingay (Kew Distrib.) as 273. Perak, Scortechini, King's collector, Wray.

3. Connaropsis macrophylla, King n. sp. A shrub or small tree: young branches glabrescent or glabrous. *Leaves* 1-foliolate, coriaceous, glabrous, oblong, acute or shortly acuminate, scarcely narrowed to the rounded sub-truncate or sub-emarginate base; main nerves 8 or 9 pairs, spreading, the reticulations distinct beneath: length 6 to 12 in., breadth 2·35 to 3·65 in.; petiole ·5 in., jointed above the middle. *Flowers* in two or three terminal or lateral spikes which are sometimes united to form a kind of panicle. *Spikes* glabrescent, 2 or 3 in. long. *Flowers* crowded. *Fruit* ovoid, apiculate, glabrous, about ·3 in. long.

Perak: King's collector, Nos. 433, 3124; Ridley No. 3087. Province Wellesley; Curtis No. 474.

4. Dapania, Korthals.

Woody climbers. *Leaves* alternate, simple, coriaceous, entire, the petiole jointed about the middle. *Flowers* small, regular, sometimes unisexual, in slender spike-like racemes which are solitary, or in fascicles, axillary or from tubercles on the stem. *Sepals* 5, connate at the base, imbricate. *Petals* 5, hypogynous, imbricate, longer than the sepals. *Stamens* 10, the alternate 5 shorter, all united at the base into a shallow tube. *Ovary* deeply 5-lobed, 5-celled, each cell usually with 1 (sometimes with 2) pendulous ovule from an axile placenta. *Fruit* clavate, the calyx persistent but not enlarged, deeply 5-lobed, the epicarp slightly fleshy, the endocarp fibrous, 5-celled, 5-seeded, dehiscing loculicidally so as to form a five-rayed fibrous star with a seed attached to the central ridge (placenta) of each segment. Distrib. About 4 species; all Malayan.

1. Dapania scandens, Stapf in Hook. Ic. Pl., t. 1997. A glabrous climber 50 to 100 feet long. *Leaves* ovate-elliptic, acuminate, the base rounded; main nerves 4 or 5 pairs, ascending, faint, length 3 to 5 in., breadth 1·25 to 2 in.; petiole ·25 to ·35 in., jointed about the middle. *Racemes* slender, puberulous, about 1·5 to 2·5 in. long. *Flowers* some hermaphrodite and some with stamens only, ·1 to ·15 in. long, each with a minute ovate bracteole at the base of its short pedicel. *Calyx-lobes* obtuse, ciliolate. *Petals* oblong, ob-lanceolate, twice as long as the calyx. *Fruit* 3 in. long, dehiscing into a flat star-shaped mass 4 in. in diam. *Connaropsis dioica*, Scortechini MSS. in Herb. Calcutta.

Perak: Curtis. Scortechini, Wray, King's collector.

By far the majority of the flowers have stamens only, the pistils

being either quite rudimentary or absent: these male flowers are about half as long again as the hermaphrodites. The genus *Dapania* was founded by Korthals to receive the Sumatran plant which that author called *D. racemosa.* Of this, there is an authentic specimen in the Calcutta Herbarium; but unfortunately it has neither flowers nor fruit. Amongst Forbes' plants collected in Sumatra, No. 1217 agrees so perfectly with Korthal's *D. racemosa* in foliage, as to leave no doubt that it belongs to the same species; and on Forbes' specimens there are ripe fruits. These ripe fruits, as well as its leaves, show *D. racemosa* to be quite distinct from *D. scandens*, Stapf, the leaves being thinner in texture, and the fruits longer than those of *D. scandens.* The seeds of Forbes' specimens do not, however, show the curious aril (laciniate and almost 2-lipped) which Korthals describes: and, as the seeds of *D. scandens* show no trace of an aril, I agree with Dr. Stapf that Korthals probably described the existence of an aril as the result of some confusion. The majority of the ovaries dissected by me have only a single ovule: in one or two cases, however, a second (as figured by Dr. Stapf) has been found. In no case, however, have I found two seeds in a loculus of the fruit. There is no doubt that, as Dr. Stapf points out, the genus *Connaropsis* comes very near *Dapania*; and it may become desirable, as both genera became better known, to reduce *Connaropsis* (which dates only from 1862) to *Dapania* which was published in 1854. In the meantime the fruit of *Connaropsis* is not properly known, and there is no evidence that it is dehiscent. The fruit of *C. monophylla* is very like that of *Dapania scandens*, but no specimens that I have seen show any sign of dehiscence; while that of *C. macrophylla* is but little angled externally and the appearance of all the specimens I have seen is suggestive of indehiscence. Moreover, all the species of *Dapania* appear to be scandent; while all those of *Connaropsis* are shrubby or arboreous. Concerning the structure of the seeds I can say nothing, not having met with good seeds of either. The two genera remain at present separated chiefly by these two points of difference, *viz.*, dehiscence of the fruit and habit. Whether others may be found remains to be seen when better materials shall be obtained.

Beccari's specimen (P. S. 900) appears to belong to a species slightly different from either *D. scandens* or *D. racemosa.* And, as I understand from Dr. Stapf, the same Collector's No. 2951, from Borneo (which I have not myself examined), belongs to still another species.

5. Impatiens, Linn.

Herbs, rarely shrubby at the base. *Leaves* opposite or alternate, in some whorled, in others all radical, simple, exstipulate, or with

stipular glands at the base of the petiole. *Flowers* in scapes, or in axillary or terminal 1–2 or many-flowered peduncles, irregular, resupinate. *Sepals* 3, rarely 5, imbricate; 2 anterior when present minute; 2 lateral small, flat, usually green; posterior (anterior in flower) large, petaloid, produced into a hollow spur or sac. *Petals* 3 (or 5); anterior (outer in bud) large; lateral 2-lobed (or 2 connate). *Stamens* 5, filaments short, broad; anthers cohering. *Disc* 0. *Ovary* oblong, 5-celled; stigma sessile, 5-toothed; ovules many, 1-seriate in each cell. *Capsule* loculicidal; valves 5, elastically springing away from a placentiferous axis. *Seeds* smooth or tubercled, glabrous or hairy, albumen 0; embryo straight.—Distrib. Mountainous parts of Trop. Asia and Africa, rare in Temp. Europe, N. America, N. Asia, and S. Africa; species about 200.

Flowers yellow: stem fleshy, several feet high and more than a foot in diam. at the base ... 1. *I. mirabilis.*

Flowers lilac, purple or white: stems herbaceous, slender.

Leaves linear-lanceolate, the upper whorled, the lower in pairs, opposite... 2. *I. Griffithii.*

Leaves linear-oblong to obovate or rotund, all opposite ... ... 3. *I. chinensis.*

1. Impatiens mirabilis, Hook. fil. in Curtis's Bot. Mag., t. 7195. Stem fleshy, cylindric, 3 to 5 feet high and 18 to 20 in. in diam. at the base, branched above. *Leaves* thinly fleshy, crowded at the ends of the branches, much narrowed to the base, obovate to ovate, crenate, with a thick fleshy midrib and 13 or 14 pairs of faint pinnate nerves, both surfaces glabrescent: length 5 to 7 in., breadth 3·5 to 4·5 in., petiole 1 to 1·5 in. *Racemes* axillary, as long as, or longer than the leaves, slender, and few-flowered. *Flowers* yellow, 1·75 in. long, sepals 3; the lateral elliptic-oblong, acute; the posterior widely hemispheric with a short incurved spur; anterior petal rotund, transversely oblong, the lateral petals united into a single 3-lobed piece.

Langkani: Curtis No. 1678.

The above description of this very remarkable species is chiefly copied from Sir Joseph Hooker.

2. Impatiens Griffithii, Hook. fil. and Thoms. in Journ. Linn. Soc. IV, 120: Fl. Br. Ind. I, 445. Herbaceous; stem a foot or more in height, erect, terete, sparsely puberulous. *Leaves* linear-lanceolate, much narrowed towards the base, those in the lower part of the stem in pairs, opposite and petiolate; those in the upper part narrower, in whorls of three and sessile; all remotely serrate-toothed, 1·5 to 4 in. long; the texture rather thick, the lower surface pale and glabrous, the upper sparsely hairy. *Pedicels* solitary, rarely paired, slender,

1 in. or more in length. *Flowers* 1 in. in diam., flattish, rose-lilac. *Sepals* ovate-oblong, acuminate: standard broadly obcordate with a filiform spur behind, the wings broadly bi-lobed. *Capsule* elliptic, turgid in the middle.

Malacca: on Mount Ophir, Gerai, &c.; Griffith, Maingay.

3. Impatiens chinensis, Linn. Herbaceous: stem 4 to 18 in. long, suberect, decumbent and rooting at the base, angled. *Leaves* subsessile, varying from linear-oblong to obovate or almost rotund, acute or obtuse, sharply serrate, always opposite, the base acute or rounded, often auricled; texture rather thick, glaucous beneath, glabrous or sparsely hairy, ·5 to 4 in. long: stipules setaceous, glandular, recurved. *Flowers* ·5 to 1 in. in diam., flattish, purple, or white. *Pedicels* solitary or fascicled, sometimes longer than the leaves. *Sepals* linear: standard orbicular, the wings semi-obovate, entire, auricled at the base; spur slender, long, incurved. *Capsule* ·5 to ·75 in. long, elliptic, turgid in the middle.

Malacca; Griffith. Distrib. China, British India.

6. Hydrocera, Blume.

A glabrous erect marsh herb. *Leaves* narrow, alternate. *Flowers* in short axillary 1–2-flowered peduncles, irregular. *Sepals* 5, coloured, imbricate; 2 outer lateral, flat; posticous one produced into a short hollow spur. *Petals* 5, the anticous outer, very large, concave. *Disc-glands* 0. *Stamens* 5; filaments short, flat; anthers slightly cohering around the pistil. *Ovary* 5-celled; stigmas 5, sessile; ovules 2–3 in each cell. *Drupe* baccate, endocarp bony, truncate, 5-celled, cells 1-seeded. *Seeds* curved, corrugated, albumen 0; cotyledons plano-convex, thickish, radicle short, superior.—Distrib. One tropical Asiatic species.

1. Hydrocera triflora, W. & A. Prod. I, 140. Annual; the stem often floating, fistular, often flexuose and rooting at the nodes; branches erect, 1 to 2 feet long, 5-angled. *Leaves* linear-lanceolate, serrate, attenuated into a petiole at the base, stipulate, glands two. *Flowers* 1 in. in diam., red white and yellow. *Drupe* globose, ·75 in. in diam., smooth, red, when dry 5-angled and truncate. Hook. fil. Fl. Br. Ind. I, 483; Miq. Fl. Ind. Bat. I, Pt. 2, 132; H. f. & T. in Journ. Linn. Soc. iv. 156. *H. angustifolia*, Blume Bijd. 241. *Impatiens triflora*, Linn. DC. Prodr. i. 687; Wall. Cat. 4756. *I.? natans*, Willd.; DC. Prodr. i. 687; Roxb. Fl. Ind. i, 652; Wall. Cat. 4755. *Tytonia natans*, G. Don, Gen. Syst. i. 749. *Balsamina angustifolia*, Burm. Thes. Zeyl. t. 16 fig. 2 (*inaccurate*).

In all the Provinces except the Andaman and Nicobar Islands. Distrib. Malayan Archipelago, British India, Ceylon.

Order XXIII. RUTACEÆ.

Trees or shrubs, rarely herbs, abounding in pellucid glands filled with essential oil. *Leaves* opposite or alternate, simple or compound, exstipulate. *Flowers* in axillary or terminal cymes or panicles, never spiked, usually bisexual and regular in the Indian species. *Calyx* of 4–5 small lobes or sepals. *Petals* 4–5, hypogynous (in the Indian genera), valvate or imbricate. *Stamens* 4–5 or 8 or 10, rarely more (*Citrus*, *Ægle*); filaments usually free, hypogynous; anthers 2-celled, opening inwards. *Disc* within the stamens, crenate or lobed, sometimes large or long. *Ovary* of 4–5 free or connate carpels; styles as many, free or variously united; stigmas terminal, entire or lobed; ovules usually 2 in each cell. *Fruit* a capsule, berry or drupe, or 1–4 capsular cocci. *Seeds* usually solitary in the cells, testa various, albumen fleshy or 0; embryo straight or curved, radicle superior.—Distrib. Tropical and extratropical. Genera 83, and about 70 species.

Ripe fruit separating into dehiscent cocci or follicles.

Flowers generally unisexual; disc free or absent; ovaries partially united; styles basilar or ventral, free at the base; cells 2-ovuled.

Leaves opposite.

Stamens 4 or 5 ... ... 1. *Evodia.*

Stamens 8, four perfect opposite the sepals, alternating with four imperfect opposite the petals... 2. *Tetractomia.*

Stamens 8, all perfect ... 3. *Melicope.*

Leaves alternate, stamens 3 to 5 ... 4. *Zanthoxylum.*

Ripe fruit indehiscent.

Flowers polygamous: petals 4, stamens 8; disc free: ovaries and styles 4, united, the cells 2-ovuled; fruit syncarpous, 4-celled, indehiscent, seed albuminous; leaves 1-foliolate ... ... 5. *Acronychia.*

Flowers hermaphrodite, petals and stamens free or connate, ovaries and styles completely united, cells 1-to many-ovuled: fruit a berry, sometimes with but little pulp, seed exalbuminous

Unarmed.

Style short, persistent; leaves 1 to 5-foliolate ... ... 6. *Glycosmis.*

Style deciduous, leaves pinnate.
Cotyledons leafy, crumpled; petals valvate; filaments linear-subulate, not dilated at the base ... ... 7. *Micromelum.*
Cotyledons fleshy, plano-convex, petals imbricate.
Filaments not dilated at the base... ... 8. *Murraya,*
Filaments dilated at the base ... ... 9. *Clausena.*

Armed; leaves 3-to 8-foliolate.
Calyx 3-lobed, petals 3, stamens 6 10. *Triphasia.*
Calyx cup-shaped, entire or obscurely lobed: petals 4, stamens 8 to 10 ... ... 11. *Luvunga.*

Armed or unarmed; leaves 1-foliolate.
Anthers linear-oblong, disc cylindric forming a gynophore ... 12. *Paramignya.*
Anthers ovate-oblong, sometimes cordate, the filaments free or conjoined into a tube; disc cupular ... ... 13. *Atalantia.*

1. Evodia, Forst.

Trees or shrubs, unarmed. *Leaves* opposite, simple or 1–3-foliolate or imparipinnate, quite entire. *Flowers* small, in panicled axillary cymes, unisexual. *Sepals* 4–5, imbricate. *Petals* 4–5, sessile, valvate or slightly imbricate. *Stamens* 4–5, inserted at the base of the disc, filaments subulate, anthers oblong. *Ovary* deeply 4-lobed, 4-celled; style basilar, stigma 4-lobed, ovules 2 in each cell, collateral or superposed. *Fruit* of 2 to 4 coriaceous 1 to 2-seeded cocci; endocarp horny, elastic. *Seeds* oblong or globular, testa bony or crustaceous, shining; hilum linear, albumen fleshy; embryo straight, cotyledons ovate.—Distrib. About 25 species, natives of tropical Asia, the Pacific, the E. African Islands, and Australia.

Leaves 3-foliolate.
Leaflets usually more or less obovate: cymes broad pyramidal or corymbose, much branched.
Lower surface of leaflets pubescent... 1. *E. latifolia.*

Lower surface of leaves glabrous.
Apices of leaflets acuminate or apiculate, main nerves rather faint, sub-horizontal or slightly ascending; cymes pyramidal... 2. *E. Roxburghiana.*
Apices of leaflets shortly and abruptly acuminate, main nerves rather faint, sub-horizontal or ascending, cymes corymbose ... ... 3. *E. glabra.*
Apices of leaflets obtuse, nerves very prominent beneath, cymes corymbose ... ... 4. *E. robusta.*
Leaflets oblong or elliptic-oblong, not at all obovate, tapering little to the ends: ripe cocci ·4 in. long ... ... 5. *E. macrocarpa.*
Leaflets oblong-elliptic, tapering to each end: cymes few-branched, very tomentose: flowers in globular masses ... 6. *E. pilulifera.*
Leaflets oval to elliptic, obtuse or subacute, very coriaceous, the edges revolute when dry: cymes small, flowers ·25 in. long ... ... 7. *E. pachyphylla.*
Leaves 1-foliolate ... ... 8. *E. pedunculosa.*

1. Evodia latifolia, DC. Prod. I., 724. A tree 15 to 20 feet high: young branches stout, obscurely 4-angled, flattened at the nodes, rusty or tawny-puberulous. *Leaves* 3-foliolate, membranous, the petiole 4 to 6 in. long, usually angled, puberulous; leaflets obovate-elliptic to elliptic, acute or shortly acuminate, the base cuneate; main nerves 13 to 18 pairs, spreading, curving, prominent beneath; upper surface glabrescent or glabrous except the tomentose midrib and nerves, the lower softly pubescent, sometimes becoming glabrescent when old; length 5 to 9 in., breadth 2·5 to 4·5 in. (the middle one usually the largest); petiole ·2 to ·4 in. *Cymes* axillary, broad, with opposite spreading rusty-tomentose branches on stoutish puberulous peduncles 1 to 2 in. long. *Flowers* less than ·1 in. long, densely crowded; sepals sub-acute, pubescent outside; petals glabrous except a few hairs on the back outside; ovary villous. *Cocci* 2 or 3 from each flower, broadly ovate, blunt, subglabrous, 1–2-seeded: seed black. Hook. fil. Fl. Br. Ind. I., 489; Miq. Fl. Ind. Bat. i. pt. 2, 672; Ann. Mus. Lugd. Bat. iii, 244. *Zanthoxylum Rumphianum*, Cham. in Linnæa v. 58.

In all the provinces, except the Andamans and Nicobars: Distrib. Malayan Archipelago.

In its flowers and fruit this closely resembles *E. Roxburghiana*, Benth., but the leaves are different.

2. Evodia Roxburghiana, Benth. Flora of Hong-Kong, 59. A small tree; branches glabrous, opposite. *Leaves* glabrous, 3-foliolate, the petiole 2 to 5 in. long, terete; leaflets thinly coriaceous, shortly petiolulate, obovate, oblanceolate or oblong, the apex rounded acuminate or apiculate: main nerves 12 to 18 pairs, horizontal or slightly ascending, not prominent; length 2·5 to 6 in., breadth 1·25 to 3·25 in., the middle leaflet the largest; petiolule ·15 to ·25 in. *Cymes* pedunculate, spreading; the branches opposite, minutely bracteolate at the base: peduncles 2 to 3 in. long: cymes about 2·5 to 3 in. in diam. *Flowers* densely crowded, whitish, ·1 to ·15 in. long; the anthers exserted, shortly pedicelled, sepals very obtuse, ovary pubescent. *Cocci* about 2 from each flower, ovoid, pointed, 1-to 2-seeded, ·2 to ·3 in. long. *Seeds* black, shining. Hook. fil. Fl. Br. Ind. I, 487; Kurz Fl. Burm. I, 180. *E. triphylla*, Bedd. Flor. Sylvat; Anal. Gen. xli. t. vi. f. 2. *E. Marambong*, Miquel Ann. Mus. Bot. iii. 244. *Fagara triphylla*, Roxb. Fl. Ind. i. 416 (? of Linn.). *F. Lunur-ankenda*, Gærtn. Carp. i., 334, t. 68. f. 9. *Xanthoxylon triphyllum*, Wight Ic. t. 204; Ill. i. 169; Grah. Cat. Bomb. Pl. 36; Dalz. & Gibs. Bomb. Flor. 45. *X. Roxburghianum*, Cham. in Linnæa v. 58. *X. zeylanicum*, DC. Prodr. i., 728. *X. nilagiricum*, Miquel Herb. Hohenack.

In all the Provinces: common. Distrib. Malayan Archipelago, British India.

A widely distributed species very common in most parts of the Malayan Peninsula, and varying a good deal in the size of the leaves and in the degree of density of the cymes. In some cases the latter are lax and open, but in the majority they are condensed. There is some doubt as to what name this plant should bear. Sir Joseph Hooker (F. B. I. l. c.) has written an excellent note on its synonymy which should be consulted. The species, except in the matter of size, differs very little from *E. triphylla*. DC.

3. Evodia glabra, Blume Bijdr. 245. A tree 40 to 70 feet high: young branches stout, compressed at the nodes, glabrous. *Leaves* 3-foliolate; the petioles 2 to 4 in. long, glabrous, terete, grooved in front towards the apex: leaflets more or less coriaceous, shortly petiolulate, obovate or obovate-elliptic, shortly and abruptly acuminate, rarely obtuse, always tapering much to the base, upper surface shining, the lower glabrous or puberulous: main nerves 10 to 15 pairs, oblique or sub-horizontal, prominent on the lower surface and often depressed on the upper when dry; length 4 to 10 in., breadth 2·25 to 5 in., petiolule ·2 to ·4 in., the middle leaflet the largest and with the longest petiolule.

Cymes pedunculate, corymbose, the main branches ascending, the secondary spreading, all opposite, minutely bracteolate at the base, puberulous or almost glabrous; peduncles stout, compressed, glabrescent, 1·5 to 4 in. long. *Flowers* ·1 in. long (excluding the exserted stamens) densely crowded, many of them practically unisexual, the ovary being abortive. *Sepals* sub-orbicular, obtuse, puberulous. *Petals* glabrous. *Stamens* exserted. *Ovary* depressed, glabrous, or hairy at the base of the styles. *Cocci* 2 or 3 to each flower, ·2 in. long, rugulose and glandular externally, broadly ovate, obtuse. *Seeds* black. Miq. Fl. Ind. Bat. I, Pt. 2, 672; Ann. Mus. Lugd. Bat. III, 243; Hook. fil. Fl. Br. Ind. I, 489.

Perak: very common. Penang, Curtis, No. 2485. Andaman Islands, King's collectors. Nicobars, Kurz.

This is best distinguished from *E. Roxburghiana* and *E. latifolia* by its more coriaceous leaves with stronger nerves, and by its more corymbose cymes. The flowers, however, are very little different in all three, and it seems doubtful whether it would not be better to treat all as forms of a single widely distributed and variable species.

4. Evodia robusta, Hook fil. Fl. Br. Ind. I., 488. A small tree; young branches as thick as a swan's quill, compressed, hoary. *Leaves* 3-foliolate, the petiole 4 in. long, terete, as thick as a crowquill: leaflets coriaceous, elliptic, the terminal sub-obovate, obtuse or obtusely acuminate, the midrib and arching nerves very strong, glabrous except the puberulous midrib beneath, the upper surface shining; length 6 to 8 in. *Cymes* broad, (5 in. in diam.), brachiate, their branches very robust. *Flowers* and fruit as in *E. Roxburghiana.*

Penang; Phillips. Singapore; Maingay (Kew Distrib.) No. 278.

This species must come very near *E. glabra*, Bl. It also greatly resembles the Sumatran *E. euneuron*, Miq. (Fl. Ind. Bat. Suppl. 532).

5. Evodia macrocarpa, King, n. sp. A tree 20 to 40 feet high: young branches rather stout, cinereous-puberulous, compressed. *Leaves* 3-foliolate, the petiole 3 to 4 in. long, glabrous: leaflets coriaceous, oblong, or elliptic-oblong, acute, narrowed to the slightly unequal-sided base; both surfaces glabrous, the upper shining, the lower dull and paler when dry; main nerves 14 to 18 pairs, almost horizontal, faint; length 6 to 12 in., breadth 2 to 3 in., petiole ·1 to ·2 in.; the middle leaflet the largest. *Cymes* axillary, pyramidal, shortly pedunculate, olivaceous-tomentose; the branches opposite, spreading, bracteolate at the base; peduncles ·5 to 1·5 in. long, puberulous. *Flowers* ·1 in. long, densely crowded, many of them with perfect stamens but an abortive ovary; sepals triangular, acute, pubescent; petals puberulous. *Stamens* exserted. *Ovary* villous. *Cocci* 3 or 4 to each flower, compressed, obovate, blunt, ·4 in. long, dark-coloured and

puberulous externally, lined inside with dense white hairs: seeds 2, black, shining.

Perak: Wray, No. 2648 and 3266; King's collector, No. 7489.

A very distinct species, recognisable at once by its long and comparatively large leaflets, small cymes, and large cocci.

6. Evodia pilulifera, King n. sp. A shrub 10 to 15 feet high: young branches rather slender, flattened at the nodes, minutely tawny-tomentose, the bark pale. *Leaves* 3-foliolate, the petiole 3 to 4·25 in. long, terete, grooved in front, deciduously tawny-tomentose; leaflets thinly coriaceous, petiolulate, oblong-elliptic, tapering to each end, the apex shortly acuminate, the base very narrow; both surfaces glabrous, the lower paler when dry: main nerves 9 or 10 pairs, oblique, interarching boldly well within the edge, prominent on the lower, depressed on the upper surface when dry; length 3·5 to 8 in,; breadth 1·25 to 2·75 in.; petiolule ·15 to ·4 in., the middle leaflet rather larger than the lateral. *Cymes* everywhere tawny-tomentose, axillary, on long peduncles; the branches few, opposite, each bearing towards the apex a few dense sub-globose masses of flowers. *Flowers* less than ·1 in. long. *Sepals* ovate, acute, densely tawny-tomentose. *Petals* glabrous. *Ovary* villous. *Cocci* slightly compressed, ovoid, blunt, minutely tawny-tomentose outside, the interior glabrous, ·2 in. long. *Seed* solitary, shining.

Perak: Scortechini, No. 360; Wray, No. 2995; King's collector, No. 6275.

This species is readily distinguished by its minutely tomentose few-branched cymes, each bearing a few densely crowded heads of small flowers.

7. Evodia pachyphylla, King n. sp. A small tree 10 to 15 feet high; young branches flattened at the nodes, minutely rufous-tomentose, as are the petiole, under surfaces of the midribs and peduncles of the cymes. *Leaves* 3-foliolate, the petiole 2·5 to 3 in. long: leaflets very coriaceous, oval to elliptic, obtuse or sub-acute, the base slightly cuneate, the edges revolute when dry; upper surface glabrous, shining, the lower pale, glaucous; main nerves 8 to 12 pairs, sub-horizontal, curving slightly, interarching within the edge, slightly prominent on the lower surface when dry, the midrib very bold; length 2·25 to 3·75 in., breadth 1·2 to 2·25 in., petiolule ·35 to ·5 in. *Cymes* axillary, pedunculate, the branches few, short, close together; peduncles 1 to 1·5 in. long. *Flowers* ·25 in. long, in dense sub-globular masses. *Sepals* broadly ovate, acute, olivaceous-tomentose externally, glabrous internally. *Petals* erect, ovate-lanceolate, pubescent on both surfaces, the edges glabrous. *Stamens* not exserted. *Ovary* glabrous. *Cocci* 2 or 3 from each flower, sub-compressed, ovate, blunt, pale and puberulous externally, glabrous within. *Seed* solitary, black, shining.

A very distinct species, at once distinguishable by its small coriaceous leaflets and large flowers and fruits.

8. Evodia pedunculosa, Hook. fil. Fl. Br. Ind. I, 489. A small tree? young branches cylindric, smooth. *Leaves* 1-foliolate; petiole rather stout, half-cylindric, ·5 to 1 in. long. *Leaflets* coriaceous, obovate, abruptly narrowed at the obtuse apex, the base cuneate: both surfaces glabrous, minutely reticulate, main nerves numerous, slender, spreading, length 4 to 5 in. *Cymes* pedunculate, pubescent, branching near the apex into small trichotomous pubescent cymules; peduncles 1 to 4 in. long. *Flowers* (buds only seen) ·1 in. long, shortly pedicelled. *Sepals* rounded. *Petals* broadly ovate, acute, glabrous. *Ovary* 4-cleft, immersed in the disc.

Singapore; Lobb.

Known only from Lobb's solitary and imperfect specimen.

2. Tetractomia, Hook. f.

Trees or shrubs. *Leaves* opposite, petioled, 1-foliolate, coriaceous, quite entire, punctate. *Flowers* small, in axillary branched cymes. *Calyx* small, 4-partite. *Petals* 4, triangular-ovate, acute, persistent, valvate. *Disc* broad, glandular, flattish or pulvinate, obtusely 4-angled. *Stamens* 4 or 8, (4 perfect alternate with the petals, 4 smaller with imperfect anthers opposite the petals and partially adnate to them at the base); filaments subulate, flattened at the base; anthers 2-lobed, dorsifixed. *Ovary* immersed in the centre of the disc, 4-celled, with 4 free projecting lobes; styles 4, free at the base, connate above; stigma capitate, obscurely 4-lobed; ovules 2, collateral in each cell. *Fruit* of 4 coriaceous, laterally compressed, oblong, 2-seeded cocci, splitting ventrally, the horny endocarp partially separating. *Seeds* inserted towards the base of the carpels.—Distrib. Three species, natives of the Malayan Peninsula and Borneo.

Leaves elliptic-obovate, 6 to 9 in. long; flowers ·25 in. long: ripe cocci ·5 in. long ...	1 *T. majus.*
Leaves usually cuneate-obovate, rarely elliptic-obovate, 2·5 to 5 in. long; flowers 1·3 in. long; ripe cocci ·25 in. long	2 *T. Roxburghii.*

1. Tetractomia majus, Hook. fil. Fl. Br. Ind. I. 491. A tree: young branches stout; their bark brown, rough. *Leaves* very coriaceous, obovate, elliptic, obtuse, narrowed to the base; both surfaces glabrous, very pale when dry: main nerves 12 to 16 pairs, rather straight, oblique, interarching far from the margin, slightly prominent or both surfaces when dry; length 6 to 9 in., breadth 3 to 4 in., petiole 2 to 2 25 in., stout, terete, slightly swollen at base and apex.

Cymes glabrous or glabrescent, 4 to 6 in. in diam., the branches opposite; bracts minute, persistent. *Flowers* ·25 in. in diam., glabrous. *Stamens* 4, perfect; the *filaments* longer than the petals and style, the 4 staminodes minute. *Ripe cocci* about ·5 in. long, keeled. *Seeds* oblong, the nucleus basal, much smaller than the oblong wing. *Tetramerista paniculata*, Kurz in Journ. Bot for 1875, p. 333.

Malacca; Maingay (Kew Distrib.) No. 290.

A rare plant known only by Maingay's scanty specimens.

2. Tetractomia Roxburghii, Hook. fil. Fl. Br. Ind. I., 491. A tree 30 to 80 feet high; young branches rather stout, glabrous, their bark pale, rough. *Leaves* coriaceous, cuneate-obovate, sometimes obovate-elliptic, the apex always broad and rounded, and very shortly and bluntly apiculate, much narrowed to the petiole; both surfaces glabrous, rather pale when dry, the upper glabrous, the lower glabrescent with numerous and rather large black dots: main nerves 7 to 9 pairs, oblique, straight, not prominent: length 2·5 to 5, rarely 6 in., breadth 1·5 to 2·5, rarely 3 in.; petiole ·5 to 1 in., rarely 1·25 in. *Cymes* glabrous in the lower, pubescent in the upper part, 3 or 4 in. in diam., pedunculate; bracts minute, persistent. *Flowers* ·13 in. in diam., puberulous. *Stamens* 8, the alternate row imperfect, minute and attached to the petals. *Ripe cocci* 1 to 3 from a flower, about ·25 in. long. *Seeds* oblong, nucleus rather shorter than the wing, Hook. fil. Icones Plantar. 1512. *Melicope tetrandra*, Roxb. Fl. Ind. II. 257.

Penang, Singapore, Perak.

A much more common plant than the last, with smaller flowers and fruit, and with leaves not only smaller but much more obovate.

3. Melicope, Forst.

Shrubs. *Leaves* opposite (in the Indian species), 1–3-foliolate, pellucid-punctate. *Flowers* small, in axillary cymes or panicles. *Calyx* 4-lobed or 4-partite. *Petals* 4, sessile, spreading, valvate or imbricate. *Disc* large, entire or 8-lobed, or obsolete. *Stamens* 8, inserted at the base of the disk, those opposite the petals shorter, filaments subulate or flattened; anthers oblong or cordate. *Ovary* 4-celled, deeply 4-lobed; style basilar, or styles 4, subterminal, more or less combined; stigma capitate, 4-lobed; ovules 2 in each, all collateral or superposed. *Fruit* of 4 free spreading coriaceous cocci, dehiscing on the inner face; endocarp more or less separating from pericarp. *Seeds* oblong, testa black, shining; embryo with large oblong cotyledons and short radicle. Distrib. chiefly Polynesian: species about 15.

1. Melicope Helferi, Hook. fil. Fl. Br. Ind. I, 492. A glabrous

dicœceous shrub: young branches rather stout, striate, sub-quadrangular. *Leaves* 1-foliolate: leaflet coriaceous, obovate-elliptic, very obtuse, narrowed to the base: main nerves about 9 pairs, spreading, inconspicuous; length 4·5 to 6 in., breadth 2 to 3 in; petiole ·75 to 1 in. *Panicles* not much longer than the petioles, few-branched, cymose. *Flowers* ·2 in. in diam. *Calyx-lobes* acute. *Petals* longer than the calyx, lanceolate, acute, puberulous outside, ridged along the midrib on the inner surface inside. Kurz For. Flora Burmah, I, 182.

Andaman Islands; Helfer (Kew. Distrib.) No. 1192.

4. Zanthoxylum, Linn.

Shrubs or trees, often armed with stout prickles. *Leaves* alternate, 3-foliolate or unequally pinnate; leaflets opposite or alternate, entire or crenate, often oblique, punctate. *Flowers* small, in axillary or terminal, peduncled, broad or narrow cymes, white, pink, or greenish, often unisexual. *Calyx* 3–8-fid, rarely 0. *Petals* 3–5, rarely 0, imbricate or induplicate-valvate. *Disc* small or obscure. *Stamens* 3–5, hypogynous or reduced to scales in the ♀. *Ovary* rudimentary in the ♂, in the ♀ of 1–5 oblique, 1-celled carpels; styles sublateral, free or connate above, stigma capitate; ovules 2 in each cell, usually collateral. *Fruit* of 1–5, globose, coriaceous or fleshy, 1-seeded cocci, dehiscing ventrally; endocarp horny, separating or not. *Seed* oblong and compressed, or globose, often hanging out of the carpel, hilum broad, testa bony or crustaceous, blue or black, shining, albumen fleshy; embryo axile, straight or curved; cotyledons flat, radicle very short.—Distrib. About 80 species, all either tropical or subtropical.

Unarmed or very slightly armed: leaves 3-foliolate; cymes axillary and terminal; fruit ·3 in. in diam. ... ... 1. *Z. ovalifolium.*

Armed; leaves pinnate, leaflets 4 to 9 pairs; cymes terminal; fruit ·12 in. in diam. ... 2. *Z. myriacanthum.*

1. Zanthoxylum ovalifolium, Wight Ill. I, 169. A shrub or tree: young branches at first puberulous but speedily glabrous, lenticellate, unarmed, or with a few short straight prickles. *Leaves* 3-foliolate: petiole 1·25 to 2·5 in., not armed; leaflets sub-coriaceous, elliptic-oblong, slightly obovate, the apex with an abrupt short obtuse point, the edges crenulate, the base narrowed; both surfaces shining: main nerves 10 to 14 pairs, sub-horizontal, not much more prominent than the intermediate nerves; length 2 to 5 in., breadth 1·2 to 2·5 in.; petiole ·2 to ·4 in., sometimes almost absent; the middle leaflet larger than the two lateral. *Cymes* slender, paniculate, pedunculate, axillary and terminal, shorter than the leaves, with few alternate branches,

puberulous when young, speedily glabrous. *Flowers* 4-to 5-merous, ·12 to ·2 in. in diam., pedicellate. *Petals* valvate. *Fruit* solitary, sub-globular, ·3 in. in diam., pitted, glabrous. *Seed* sub-globose. Hook. fil. Fl. Br. Ind. I, 492. *Z. undulatum*, Wall. Cat, 1208. *Z. lucidum*, Wall. Cat. 1212. *Toddalia mitis*, Miq. MSS. *Limonia leptostachya*, Jack MSS. Wall. Cat. (without name) 7472 and 7469.

Singapore: Wallich. Andaman Islands, King's collectors. Distrib.: British India, Sumatra.

2. Zanthoxylum myriacanthum, Wall. Cat. 1214. A glabrous tree 40 feet high, all parts except the petioles armed with short straight prickles. *Leaves* 1 to 1·5 feet long; leaflets 4 to 9 pairs, coriaceous, oblong-lanceolate, acuminate, entire or very obscurely and minutely crenate; main nerves about 8 pairs, spreading, not prominent even when dry; length 3 to 4 in., breadth 1·25 to 1·5 in., petiolule ·1 to ·2 in. *Cymes* terminal, pedunculate, spreading, 6 to 8 in. in diam.; peduncle armed, 5 or 6 in. long; branches long, sub-opposite or alternate. *Flowers* ·2 in. in diam., sub-sessile, 5-merous. *Calyx* with a few small bracts at the base. *Ovaries* 3. *Ripe fruit* compressed, ·12 in. in diam., apiculate. *Seed* compressed. Hook. fil. Fl Br. Ind. I, 496. *Z. longifolium*, Wall. Cat. 7115.

Penang: Porter, Curtis No. 1076. Malacca; Maingay (Kew Distrib.) No. 279.

There are in Scortechini's Herbarium some scraps of a *Zanthoxylum* which appears to be *Z. glandulosum*, Teysm. and Binn.; but without better specimens I hesitate to include that species here.

5. Acronychia, Forst.

Trees, with opposite or alternate, 1-rarely 3-foliolate leaves; leaflets entire. *Flowers* polygamous, small or moderately sized, yellow, in pedunculate, terminal, or axillary corymbs. *Petals* 4, valvate, spreading, revolute. *Stamens* 8, inserted under a thick, 8-angled, tomentose disc; filaments subulate, the alternate longer. *Ovary* inserted in the hollowed apex of the disc, tomentose, 4-celled. *Style* terminal; stigma 4-grooved; ovules 2 in each cell, superposed. *Fruit* a 4-celled drupe, or 4-valved loculicidal capsule. *Seeds* with black testa and copious albumen; embryo straight; cotyledons flat, oblong. Distrib. About 15 species: all tropical Asiatic or Australasian.

Flowers ·35 to ·75 in. in diam., linear in bud, filaments villous, inflorescence cymose ... 1. *A. laurifolia.*

Flowers ·15 in. in diam., globular in bud, filaments glabrous, inflorescence racemose ... 2. *A. Porteri.*

1. Acronychia laurifolia, Blume Bijdr. 245. A small tree or

shrub; young branches puberulous, speedily becoming glabrous. *Leaves* sub-opposite, 1-foliolate; leaflet thinly coriaceous, oblong, elliptic or sub-obovate, obtusely acuminate or obtuse, the base much narrowed; both surfaces glabrous, shining, reticulate: main nerves little more prominent than the secondary, 14 to 18 pairs, forming a double series of loops within the edge; length 2 to 6 in., breadth 1·1 to 2·4 in., petiole ·5 to ·75 in. *Cymes* axillary, slender, long-peduncled, corymbose, the branches opposite, bracts and bracteoles minute. *Flowers* linear in bud, when open ·35 to ·75 in. in diam., pale yellow. *Sepals* small, semi-orbicular, short. *Petals* linear-oblong, obtuse, widening at the base, revolute, more or less villous on the inner surface. *Filaments* villous below. *Ovary* villous, style short, stigma capitate. *Drupe* sub-globular to ovoid, with an angular apiculus, sometimes narrowed at the base and occasionally lobed, 4-angled when dry, from ·25 to ·4 in. long, 3- or 4-celled. Hook. fil. Fl. Br. Ind. I, 498; Miq. Fl. Ind. Bat. I, pt. 2, 668; Kurz For. Flora Burmah, I, 184. *A pedunculata*, Miq. Fl. Ind. Bat. Suppl. 532: Ann. Mus. Lugd. Bat. III, 245; Thwaites Enum. Pl. Ceyl. 409. *Cyminosma pedunculata* DC. Prod. I., 722: Thwaites Enum. Pl. Ceyl. 69: Wall. Cat. 1205. W. & A. Prod. 147; Wight Ill. I, 165, t. 65; Dalz. & Gibs. Fl. Bombay, Suppl. 17. *C. Ankenda*, Gærtn. Fruct. I, 280, t. 58. *Clausena simplicifolia*, Dalz. in Kew Journ. Bot. III, 180. *Jambolifera pedunculata*, Vahl Symb. III, 52, fig. 61. *Gela lanceolata*, Lour. Fl. Coch. I, 232. *Selus lanceolatum*, Spreng. Syst. II, 216. *Ximenia? lanceolata*, DC. Prod. I, 533. Wall Cat. *indeterm.* 9028.

In the Andaman and Nicobar Islands. DISTRIB. British India and Ceylon, Malayan Archipelago, Cochin China.

A widely distributed and variable species, of which Sir Joseph Hooker (Fl. Br. Ind. I, 498) recognises six varieties. Of these, however, only two occur in the Malayan Peninsula, the only very well marked form being (6) with flowers 1 in. in diam. and subglobose, fruit nearly 7 in. in diam.; and (5) with small fruit lobed at the apex.

2. ACRONYCHIA PORTERI, Hook. fil. Fl. Br. Ind. I, 498. A tree 15 to 30 (or even 50) feet high: young branches glabrous, pale. *Leaves* opposite or alternate, 1-foliolate; leaflet coriaceous, oblong, slightly obovate, usually acute or shortly acuminate, sometimes obtuse, the base much narrowed: both surfaces glabrous dull and opaque: main nerves 8 to 10 pairs, straight, oblique, slightly prominent beneath when dry; length 3 to 8 in., breadth 1·25 to 3 in., petiole ·5 to ·75 in. *Racemes* often several from one axil, sometimes as long as, but usually shorter than the leaves, slender, puberulous towards the apex, minutely bracteolate. *Flowers* ·15 in. in diam., much shorter than their pedicels, in pairs or sub-verticellate, globose in bud. *Sepals* triangular, acute.

Petals broadly ovate-oblong, pubescent inside. *Filaments* glabrous. *Ovary* glabrescent. *Style* very short; stigma large, ob-pyramidal, 4-lobed. *Drupe* ovoid, tapering to each end, 4-angled when dry, minutely pitted, 4-celled, but often only 2-seeded, ·5 in. long and ·3 in. diam. when dry.

Penang: Porter, Maingay (Kew Distrib.) No. 280, Curtis. Malacca: Griffith. Perak: Scortechini, King's collector.

6. Glycosmis, Correa.

Unarmed shrubs or trees. *Leaves* 1-foliolate or imparipinnate; leaflets alternate. *Flowers* small, in axillary, rarely terminal panicles. *Calyx* 4–5-partite, segments broad, imbricate. *Petals* 4–5, imbricate. *Stamens* 8–10, free, inserted round a disc; filaments subulate, dilated below; anthers small, with often a dorsal or apical gland. *Ovary* 2–5-celled; style very short, persistent, stigma simple, ovules solitary and pendulous in each cell. *Berry* small, dry or fleshy, 1–3-seeded. *Seeds* oblong, testa membranous; cotyledons equal, radicle very short.—Distrib.—Species 5, Asiatic and Australian.

Ovary glabrous: fruit globular	1.	*G. pentaphylla.*
Ovary hairy: fruit oblong, narrowed at the base	2.	*G. sapindoides.*
Ovary rusty-pilose	3.	*G. puberula.*

1. Glycosmis pentaphylla, Corr. in Ann. Mus. VI, 384. A glabrous shrub or small tree. *Leaves* 3- to 5-foliolate, or 1-foliolate, leaflets subcoriaceous, varying from elliptic-lanceolate, lanceolate, oblong, or obovate, or linear-lanceolate to oblong or even obovate; the apex acute, acuminate or obtuse; the edges entire or crenulate; the base narrowed; both surfaces shining; main nerves 4 to 9 pairs, oblique, curving, rather prominent beneath, and depressed above when dry; length 1·5 to 15 in., breadth ·5 to 6 in., petiolule ·1 to ·5 in. *Panicles* cymose, puberulous to glabrous, varying much in size, usually axillary, but often terminal. *Flowers* small. *Ovary* glabrous, 5-celled, rarely 3- to 4-celled: style short, stout. *Berry* globose, white or bluish white, from the size of a pea to that of a cherry. Hook. fil. Fl. Br. Ind. I, 499; Kurz For. Burmah, I, 186: Miq. Fl. Ind. Bat. I, pt. 2, 522: DC. Prodr. i. 538; W. & A. Prodr. 93; Oliv. in Journ. Linn. Soc. v., Suppl. ii. 37; Wall. Cat. 6374; Thwaites Enum. 45 and 406; Dalz. & Gibs. Bomb. Fl. 29; Bedd. in Trans. Linn. Soc. xxv. 211; Flor. Sylv. Anal. Gen. xliii. t. 6, f. 6. *G. chylocarpa*, W. & A. Prodr. 93. *G. arborea*, DC. l. c.; Wall. Cat. 6373; Thwaites Enum. 45. *G. Retzii*, Roem. Synops. fasc. i. 41. *Sclerostylis pentaphylla*, Bl. Bijdr. 135. *Limonia pentaphylla*, Retz Obs. v. 24; Roxb. Cor. Pl. t. 84; Flor. Ind. ii. 381. *L. arborea*, Roxb. Cor.

Pl. t. 85; Fl. Ind. l.c.; Bot. Mag. t. 2074. *Myxospermum chylocarpum*, Roem. Synops. fasc. i. 40.

In all the Provinces: common. Distrib.—Malayan Archipelago, British India, Philippine Islands, Australia.

A very variable and most perplexing species, the Protæan forms of which were first reduced to order by Professor D. Oliver (Journ. Linn. Soc. V, Suppl. II. p. 36). Of the forms recognised by Dr. Oliver only some are found in the Malayan Peninsula and Andaman Islands. Sir Joseph Hooker (in Fl. Br. Ind.) follows Professor Oliver for the most part; and from that book I copy the following account of the varieties. The Calcutta Herbarium is overloaded with specimens of this plant, many of which it is difficult to fit in under any of Professor Oliver's varieties; and for one of these I have ventured to suggest the varietal name *macrorachis*.

Var. 1: Leaves usually 3-, rarely 1- or 5-foliolate; leaflets 4–9 in., lanceolate or oblong, or obovate-lanceolate, quite entire or obscurely crenulate; panicles towards the tips of the branches usually elongate, many-flowered; ovary usually covered with mamillary glands, 5-celled, connate with the disc at the base.—The commonest form in the Malay Peninsula.—Distrib.; British India.

Var. 2: Leaves usually 3–5-foliolate (except sub-var. 1); leaflets elliptic or elliptic-lanceolate; panicles small, few or many-flowered, flowers smaller; ovary 4–5-celled, scarcely mamillate, constricted at the base and thus free from the disc.—*G. triphylla*, Wight in Hook. Bot. Misc. iii. 298, Suppl. t. 39; Ic. t. 167; W. & A. Prodr. 93. *G. nitida*, W. & A. Prodr. l. c.—The commonest form in the Andaman Islands. Distrib.—Western Peninsula, Ceylon, Tenasserim.

Sub-var. 1. *longifolia*: leaves usually 1-foliolate, leaflets 3–10 in., oblong or obovate-lanceolate, often acuminate or even caudate; panicles short, 1–2 in., or if terminal 3–4 in.—Malacca, Assam, the Khasia Mts., Rangoon.

Sub-var. 2. *macrophylla*: Leaves 3–5-foliolate, with the leaflets $3\frac{1}{2}$–6 in., or 1-foliolate with the leaflets 8 to 12 in. long, by 2·5 to 6 in. broad. *G. macrophylla*, Lindl. in Wall. Cat. 6377, Miq. Fl. Ind. Bat. I, pt. 2 p. 522. *Chionotria rigida*, Jack in Mal. Misc. ex. Hook. Comp. Bot. Mag. I, 155. *Ch. monogyna*, Walp. Rep. I, 382. *Sclerostylis macrophylla*, Bl. Bijdr. 135. Penang. Distrib.—Assam. Tavoy.

Sub-var 3. *macrorachis*, King, leaflets 1-foliolate, oblong-lanceolate, acuminate, 9 to 15 in. long and 3·5 to 5 in. broad: cymes small, pedicellate, arranged on a raceme 4 to 9 in. long. Penang: Curtis No. 89.

2. Glycosmis sapindoides, Lindl. in Wall. Cat. 6376. A shrub. *Leaves* 5-to 7-foliolate; leaflets sub-coriaceous, oblong or lanceolate,

acuminate or sub-acuminate, both surfaces glabrous; main nerves 7 to 9 pairs, oblique, faint: length 3 to 8 in., breadth 1 to 3 in., petiole about ·2 in. *Panicles* cymose, sub-pyramidal, axillary and terminal. *Flowers* shortly pedicelled. *Ovary* 2- to 3-celled, hairy, about as long as the thick style. *Berry* oblong, narrowed to the base, usually 1-seeded. Hook. fil. Fl. Br. Ind. I, 501. *G. cyanocarpa*, Spreng. VAR *sapindoides*, Kurz in Journ. Bot. for 1876, p. 34.

Penang: Wallich, Maingay, Curtis. DISTRIB.—Sumatra, Java, Sikkim.

I doubt very much indeed whether this would not be better treated as a variety of *G. pentaphylla*, than as a species. Except the hairiness and the smaller number of cells usually found in its ovary, and its oblong fruit, I see nothing to distinguish it.

3. GLYCOMIS PUBERULA, Lindl. in Wall. Cat 6375. A shrub: *leaves* usually 3-foliolate; leaflets sub-coriaceous, ovate to oblong-lanceolate, more or less bluntly acuminate; the base rounded or cuneate, lower surface pale when dry; main nerves about 8 pairs, spreading; length 2·5 to 4·5 in., breadth ·75 to 1·5 in. *Panicles* short, axillary; flowers in short pedicels; disc small, adnate to the 4- to 5-celled oblong rusty-pilose ovary. *Style* very short.

Penang: Singapore, Perak: not common.

Except in its pilose ovary this differs but little from *G. pentaphylla* Corr., of which it would be perhaps well to treat it as a form.

7. MICROMELUM, Blume.

Unarmed trees. *Leaves* imparipinnate; leaflets alternate, oblique. *Flowers* in large terminal corymbose cymes. *Calyx* cupular, 3–5-toothed or lobed. *Petals* 5, free, thick, valvate or subimbricate. *Stamens* 10, free, inserted round a short or long disc; filaments linear-subulate, alternately shorter. *Ovary* 5- rarely 2–6-celled; style constricted at the base, deciduous, stigma obtuse or capitate; ovules 2, superposed in each cell. *Berry* small, dry, usually 1–2-seeded, septa spirally twisted. *Seeds* oblong, testa membranous; cotyledons leafy, crumpled, radicle long.—DISTRIB.—Species 3 or 4: tropical Asiatic and Oceanic.

A large shrub or small tree: fruit glabrous ... 1. *M. pubescens.*

A small shrub, never a tree: fruit pubescent... 2. *M. hirsutum.*

1. MICROMELUM PUBESCENS, Blume Bijdr. 137. A large shrub or small tree; the young parts more or less pubescent or puberulous, the older often glabrescent or even glabrous. *Leaves* 6 to 18 in. long: leaflets 9 to 15, alternate or sub-opposite, membranous, broadly lanceolate to ovate, acuminate, the edges undulate, sub-cuneate or entire; the base cuneate, often very oblique; main nerves 9 to 12

pairs, oblique, not prominent; length 1·5 to 3·5 in., breadth ·5 to 2in. *Cymes* large, terminal, much branched, pedunclate, 4 to 8 in. in diam., many-flowered, minutely bracteolate. *Flowers* ·25 to ·5 in. in diam., on pedicels ·1 to ·2in. long, buds oblong. *Calyx* sub-entire or 5-toothed. *Petals* linear-oblong, sub-acute. *Filaments* alternately longer. *Ovary* mostly pubescent, usually 5-celled. *Berry* ovoid or oblong, ·3 to ·4 in. long, pitted, glabrescent, 1-seeded. Hook. fil. Fl. Br. Ind. I, 501; Kurz For. Flora Burmah I, 186: Oliv. in Journ. Linn. Soc. v. Suppl. ii. 40; Bedd. Flor. Sylv. Anal. Gen. xliii. t. 7, f. 1; Thwaites Enum. 46. *Bergera integerrima*, Roxb. Fl. Ind. ii. 376; Wall. Cat. 6371. *Aurantiacea*, Wall. Cat. 8517, 8518.

In all the Provinces. Distrib.—British India, China, the Malayan Archipelago, and Australasia.

2. Micromelum hirsutum, Oliver in Journ. Linn. Soc. V. Suppl. II, 40. A shrub, all parts (but especially the inflorescence) more or less tomentose, rarely glabrescent. *Leaves* 6 to 12, rarely 15 in. long; leaflets membranous, 9 to 25, lanceolate or oblong-lanceolate, rarely ovate, shortly acuminate, the edges obscurely serrate, the base often oblique, lower surface softly tomentose; main nerves 5 to 10 pairs, rather prominent beneath: length 1·5 to 3·5 in., breadth ·8 to 1·5 in. *Cymes* terminal, very tomentose, often lax, and 6 to 8 in. in diam., but sometimes condensed and only 2 in. in diam. *Flowers* ·25 in. in diam. *Calyx* deeply 5-lobed, hirsute. *Ovary* villous. *Berry* oblong or obovoid, pubescent, pitted. Hook. fil. Fl. Br. Ind. I, 502; Kurz For. Flora Burmah I, 187: Wall Cat. 8516.

Penang, Singapore, Perak, but not very common. Distrib.—British India, Burmah, Philippines.

This is closely allied to *M. pubescens*, but is usually a smaller shrub. The chief differences between the two lie in the greater amount of pubescence in this, and the smaller size of its flowers.

8. Murraya, Linn.

Unarmed shrubs or small trees. *Leaves* pinnate; leaflets alternate, petioled, base oblique or cuneate. *Flowers* solitary and axillary, or in terminal corymbs or axillary cymes. *Calyx* 5-fid or partite. *Petals* 5, free, imbricate. Stamens 10, inserted on an elongate disc; filaments subulate, alternately shorter: anthers shortly ovate. *Ovary* 2- to 5-celled, narrowed into the long deciduous style, stigma capitate; ovules solitary, or 2 superposed or collateral in each cell. Berry oblong or ovoid, 1- to 2-celled, 1- to 2-seeded. *Testa of seed* woolly or glabrous; cotyledons fleshy, plano-convex, similar. Distrib.—4 species, tropical Asiatic.

1. Murraya exotica, Linn. A glabrous shrub or small tree: young branches terete, the bark pale when dry. *Leaves* 4 to 5 in. long, 3-to 8-foliolate; leaflets thinly coriaceous, shining, ovate or ovate-lanceolate, occasionally rhomboid, more or less obtusely acuminate, the apex often notched, edges entire; the base cuneate, often oblique. *Corymbs* terminal, few-flowered. *Flowers* campanulate. *Sepals* acute. *Petals* oblong-lanceolate, white. *Ovary* 2-celled, style slender, stigma capitate. *Berry* ovoid or sub-globose, shining, red when ripe, ·5 in. long, 2-seeded. Hook fil. Fl. Br. Ind. I, 502; Miq. Fl. Ind. Bat. I, Pt. 2 p. 522; Kurz For. Flora Burmah I, 190; Oliver in Jour. Linn. Soc. V, Suppl. II, 28: Roxb. Fl. Ind. II, 374; Blume Bijdr. 1363; Wall. Cat. 6368; Thwaites Enum. 45; Wight Ic. t. 96; Brandis For. Flora N. India, 48. *M. exotica* and *brevifolia*, Thwaites Enum. 45. *M. paniculata*, Jack in Mal. Misc. I, 31 ex Hook. Bot. Misc. II, 79; DC. Prodr. I, 537; W. & A. Prodr. 94; Dalz. and Gibs. Bomb. Flor. 29. *M. sumatrana*, Roxb. Fl. Ind. II, 375; Wall. Cat. 6369; Miq. Fl. Ind. Bat. l. c. 523. *Chalcas paniculata*, Linn. *Ch. sumatrana*, Roem. Synops. fasc. I, 49. *M. Glenieii*, Thwaites Enum. 406; Oliv. in Journ. Linn. Soc. v. Suppl. II, 29.

Andaman Islands. Malayan Peninsula, Griff. (Kew Distrib.) No. 520. Distrib.—British India, China, Australia. Much cultivated in gardens on account of the fragrance of its flowers.

9. Clausena, Burm.

Unarmed shrubs or trees. *Leaves* imparipinnate, usually deciduous, leaflets membranous. *Flowers* small, in terminal or axillary cymes panicles or lax racemes. *Calyx* 4–5-lobed or-partite. *Petals* 4–5, free, membranous, margins imbricate. *Stamens* 8–10, inserted round an elongated disc, the alternate shorter; filaments usually dilated or arched and concave below the subulate tip; anthers short. *Ovary* stipitate, 4–5- (rarely 2–3-) -celled; style usually distinct, deciduous; stigma obtuse, entire or 2–5-lobed; ovules 2, collateral, or superposed in each cell. *Berry* small, ovoid, oblong or globose, 2–5-celled. *Seeds* oblong, testa membranous; cotyledons equal, plano-convex. Distrib. Species about 14; chiefly tropical Asiatic, with a few African and Australian.

1. Clausena excavata, Burm. Fl. Ind. 87. A shrub or small tree: young branches pubescent or tomentose, as are the young leaves and the inflorescence. *Leaves* 6 to 12 in. long; leaflets 15 to 29, membranous, lanceolate to oblong-lanceolate, acuminate, obscurely crenate; the base narrowed, very oblique; the upper surface when adult glabrescent or glabrous; length 1·5 to 3·4 in., breadth ·5 to 1 in.; petiolule ·1 in.. *Panicle* terminal, pyramidal, its length 4 to 12 in, of which the peduncle forms a third; branches spreading, alternate. *Flowers* ·25

in. in diam., with globose buds, 4-merous; pedicels longer than the flowers. *Calyx* much shorter than the oblong glabrous petals. *Ovary* ovoid, slightly 4-angled, hairy, stipitate; style stout, about as long as the ovary. *Fruit* broadly ovoid, blunt at each end, 1- to 2-seeded. Hook. fil. Fl. Br. Ind. I., 504: Miq. Fl. Ind. Bat. I, pt. 2, p, 524: Kurz For. Flora Burmah I, 188; Blume Bijdr. 139; DC. Prodr. I. 538; Oliv. in Journ. Linn. Soc. v. Suppl. ii. 31. *Murraya Burmanni*, Spreng. Syst. Veg. ii. 315. *Amyris sumatrana* and *punctata*, Roxb. Fl. Ind. ii. 250, 251. *Cookia graveolens*, W. & A. Prodr. 95; Wall. Cat. 8515. *Gallesioa graveolens*, Roem. Synops, fasc. i. 45.

In all the provinces except the Andaman and Nicobar islands. Distrib.—British India, Malayan Archipelago, near the bases of hill ranges.

10. Triphasia, Lour.

A spiny shrub. *Leaves* alternate, sessile, 3-foliolate; leaflets obtuse, crenate, the lateral smaller. *Flowers* solitary or in 3-flowered cymes, axillary. *Calyx* 3-lobed. *Petals* 3, free, imbricate. *Stamens* 6, inserted round a fleshy disc; filaments free, subequal, dilated at the base, anthers linear. *Ovary* ovoid, 3-celled, narrowed into a slender deciduous style; stigma obtuse or capitate and 3-lobed; ovules solitary in each cell. *Berry* small, ovoid, 1–3-celled, 1–3 seeded. *Seeds* oblong, immersed in mucilage, testa coriaceous; cotyledons plano-convex, often unequal or lobed.

1. Triphasia trifoliata, DC. Prod. I, 536. A small glabrous spiny shrub. *Leaflets* coriaceous with obscure nerves, crenulate, dissimilar; the terminal one shortly petiolate, ovate, obtuse, retuse, the base cuneate; the lateral smaller, oblique. *Flowers* about ·5 in. long, white. *Petals* linear-oblong. *Fruit* ovoid, apiculate, glandular-dotted. Hook. fil. Fl. Br. Ind. I, 507; Miq. Fl. Ind. Bat. I. pt. 2. p. 519; Kurz For. Flora Burmah, I, 191: Blume Bijdr 132; Oliv. Journ. Linn. Soc. v. Suppl. ii 26; W. & A. Prodr. 91; Dalz. & Gibs. Bomb. Fl., Suppl. 12. *T. aurantiola*, Lour. Fl. Fl Coch. I, 189; Wall. Cat. 6381. *Limonia trifoliata*, Linn.; Burm. Fl. Ind. t. 35, f. 1.; Bl. Bijdr. 132. *L. diacantha*, DC. Prodr. i. 536.

Nicobar Islands: Kurz. Distrib. British India and various tropical countries, but often doubtfully wild. It is possible this may not really be indigenous in the Nicobars, as these islands have for ages been frequented by Malayan pirates, who may have inadvertently introduced it.

11. Luvunga, Hamilt.

Glabrous, climbing shrubs, usually armed with axillary (often hooked) spines. *Leaves* 3-foliolate; leaflets coriaceous, quite entire.

Flowers in axillary fascicled or panicled racemes. *Calyx* cupular, entire or obscurely 4–6-lobed. *Petals* 4–5, free, linear-oblong, thick, imbricate. *Stamens* 8 or 10, inserted around a cupular annular or elevated disc; filaments equal or not, linear-subulate, free or cuneate; anthers linear or linear-oblong. *Ovary* 2–4-celled; style stout, deciduous, stigma capitate; ovules 2, superposed in each cell. *Berry* large, ellipsoid, with a thick rind, 2–3-seeded. *Seeds* large, ovoid; testa membranous, nerved; cotyledons equal, oblong, fleshy,—Distrib. About 4 species: tropical Asiatic.

Leaflets oblong-lanceolate to oblong-oblanceolate; filaments glabrous, united into a tube	1 *L. scandens.*
Leaflets elliptic, more or less obovate; filaments free, often woolly ...	2 *L. eleutheranthera.*

1. Luvunga scandens, Ham. in Wall. Cat. 6382. A large woody climber. *Leaflets* oblong-lanceolate to oblong-oblanceolate, acute or blunt, the base narrowed, nerves very obscure; length 4 to 12 in., breadth 1 to 2 in., petiolules about ·2 in.; petioles terete, stout, 2 to 5 in. long. *Cymes* many-flowered, short, broad, (1·5 to 2 in. across), on short peduncles. *Flowers* ·5 to ·75 in. long, white. *Calyx-lobes* short, obtuse. *Petals* 4, fleshy, recurved. *Stamens* with glabrous filaments united into a tube (sometimes for three-quarters of their length). *Ovary* 3- to 4-celled. *Berry* of the size of a large olive, yellowish, obscurely 3-lobed, the pericarp smooth. Hook. fil. Fl. Br. Ind. I, 509; Kurz For. Flora Burmah I, 191; Wight Ill. i. 108; Oliv. in Journ. Linn. Soc. v. Suppl. ii. 43; Bot. Mag. t. 4522. Pierre For. Flora Coch. Chine, t. 288. *Limonia scandens*, Roxb. Fl. Ind. ii. 380.

Malacca: Maingay (Kew Distrib.) No. 285. Distrib. British India.

2. Luvunga eleutheranthera, Dalz. in Hook. Kew Journ. Bot. II. 258. A woody climber like the last, the spines usually hooked; leaflets elliptic and usually more or less obovate, shortly and abruptly acuminate; main nerves 8 to 12 pairs, slightly prominent. *Cymes* axillary, many- or few-flowered. *Filaments* free, often woolly in the upper part. *Fruit* as in the last. Hook. fil. Fl. Br. Ind. I. 511; Oliv. in Journ. Linn. Soc. v. Suppl. ii. 44; Dalz. & Gibs. Bomb. Flor. 30. *L. tavoyana*, Lindl. in Wall. Cat. 6383. *L. scandens* and *eleutheranthera*, Thwaites, Enum. 47, 48, 406. *Triphasia sarmentosa*, Blume Bijd. 132; Miq. Fl. Ind. Bat. I. pt. 2, p. 520.

Perak: common. Pahang. Penang.—Distrib. Malayan Archipelago, W. Peninsula of British India, Ceylon.

This plant differs from *L. scandens* (to which it is closely allied) in having more obovate leaves, with much more distinct nervation, and

free filaments which are often woolly. It appears to be pretty widely distributed in Java, and is I think without doubt Blume's *Triphasia sarmentosa*.

12. Paramignya, Wight.

Erect or climbing shrubs, unarmed, or with axillary spines. *Leaves* 1-foliolate, the joint often obscure, quite entire, subcoriaceous, persistent. *Flowers* rather large, axillary, solitary or fascicled. *Calyx* cupular or small, and 4–5-lobed. *Petals* 4–5, free, imbricate or rarely induplicate-valvate. *Stamens* 8–10, inserted round a columnar disc; filaments free, linear, equal or subequal, anther linear-oblong. *Ovary* 3–5-celled; style elongate, deciduous; ovules in each cell solitary, or 2 obliquely superposed. *Berry* ovoid or subglobose, often contracted at the base, 1–5-seeded, rind thick. *Seeds* large, oblong, much compressed, testa membranous; cotyledons fleshy, equal.—Distrib.—Species 6; tropical Indian.

Spines short, solitary, axillary, curved, pubescent; flowers ·7 in. long, on slender pedicels longer than themselves ... ... { 1 *P. armata.* var. *andamanica.*

Spines long, in pairs, stipular, straight, glabrous; flowers ·35 in. long, on short pedicels ... 2 *P. longispina.*

1. Paramignya armata, Oliver in Journ. Linn. Soc. V. Suppl. II, 43, var. andamanica, King. A scandent shrub; young branches slender, puberulous, speedily becoming glabrous. *Leaflets* elliptic or elliptic-oblong, sub-acute or acute, the base rounded; glabrous except (when young) the upper surface of the midrib near the base; the reticulations and the 10 to 12 pairs of spreading main nerves slightly prominent on the lower surface when dry, the glandular dots also rather prominent; length 4 to 5·5 in., breadth 1·5 to 2·75 in.; petiole ·5 in., pubescent when young especially on the upper surface. *Spines* short, solitary in the axils below the pedicels, slightly curved, pubescent. *Flowers* axillary, in pairs, on slender sparsely pubescent pedicels longer than themselves; pedicels 1·25 to 1·5 in. long, bracteolate at the base. *Calyx* short, deeply divided into 5 broadly obtuse, spreading lobes. *Petals* about five times as long as the calyx, linear-oblong, obtuse, glabrous, ·6 in. long. *Stamens* 10, free, almost as long as the petals: the filaments rather thick and woolly below, slender and glabrous towards the apex; anthers narrowly oblong. *Disc* short, cylindric; not broader than the ovary. *Ovary* ovoid; style elongate, crowned by the discoid stigma, all glabrous. *Fruit* globular or turbinate, smooth, ·5 to ·65 in. in diam.

Andaman Islands: common.

This differs from the typical *P. armata*, Oliver, as it occurs in

Western Peninsular India and in Ceylon, mainly in the size of its leaves, and in its flowers being less numerous in their axils. In its flowers it agrees well with the typical form. It also resembles *P. monophylla*, W. and A.; but the filaments of the stamens of that species are glabrous or nearly so, and taper suddenly to a short point, while the filaments of this are thick and woolly in the lower three-fourths, the upper fourth being filiform and glabrous. The ovary of this is glabrous, of that pubescent; moreover the flowers of this are on long filiform pedicels which arise by pairs from the axils; while in *P. monophylla* the pedicels are short, and are united above the point of origin from the axil. The calyx of *P. monophylla* is besides longer, but much less deeply lobed; it is also pubescent or tomentose, while the calyx of this is glabrous. The disc in this plant is nothing more than a short gynophore.

2. Paramignya longispina, Hook. fil. Fl. Br. Ind. I, 511. A small rigid glabrous tree; branches rather stout, armed with stout straight spines ·75 to 1·5 in. long, and rising from each side of the insertion of the petioles. *Leaves* elliptic-oblong to elliptic, acute or obtuse, the base rounded, nerves indistinct, length 2·5 to 4·5 in., breadth 1·1 to 1·75 in., petiole ·2 in. *Flowers* ·35 in. in diam., axillary, solitary or 2 or 3 together, pedicels short. *Calyx* 5-toothed. *Petals* oblong, obtuse. *Stamens* 10, equal, glabrous; anthers narrow, as long as the filaments, apiculate. *Ovary* glabrous, standing on the disc (gynophore): style stout, cylindric; ovules in pairs. *Fruit* ovoid, much apiculate, 1·25 to 1·75 in. long, glabrous, 3 or 4-celled; the pericarp coriaceous. *Seeds* compressed, beaked. *Atalantia longispina*, Kurz Journ. As. Soc. Bengal, for 1872, pt. 2, p. 295. *Paramignya angulata*, Kurz For. Flora Burmah, I, 194. *Gonocitrus angulatus*, Kurz in Herb. Calc. *Citrus angulata*, Willd.? *Limonia angulata*, W. & A. Prodr. 91; Miq. Fl. Ind. Bat. I, pt. 2. p. 521. Malacca: Maingay (Kew Distrib.) l. c. 286. Perak: Scortechini Distrib.—Burmah.

13. Atalantia, Correa.

Unarmed or spinous shrubs or trees. *Leaves* alternate, 1-foliolate, coriaceous, persistent, quite entire or crenulate; stipule-like scales often present at the base of the petioles and spines, which belong to undeveloped leaf-buds. *Flowers* axillary, rarely terminal, fascicled or or in short racemed corymbs, or panicles, rarely solitary. *Calyx* 3–5-lobed or, partite-rarely irregularly split. *Petals* 3-5, free or adnate to the stamens and united with them into a tube, imbricate. *Stamens* 6–8, rarely 15–20, inserted round an annular or cupular disc, filaments free or irregularly connate, subequal or the alternate shorter; anthers

short, ovate-oblong, or base cordate. *Ovary* 2- or 4-, rarely 3- or 5- celled: style deciduous, stigma capitate; ovules solitary or 2 collateral in each cell. *Berry* large, sub-globose, 1–5-celled, 1–5-seeded, rind thick. *Seeds* oblong; cotyledons fleshy, plano-convex.—DISTRIB.—Species about 10, chiefly tropical Asiatic.

Armed; leaves 1·25 to 2·5 in. long ... 1. *A. monophylla.*
Unarmed; leaves 4 to 6 in. long ... ... 2. *A. Roxburghiana.*

1. ATALANTIA MONOPHYLLA, Correa Ann. du Mus. VI, 383. A large shrub or small tree: the young branches sometimes pubescent at the very tip, usually more or less armed with short, solitary, straight, axillary spines. *Leaves* lanceolate, oblong-ovate, ovate or elliptic; the apex obtuse, often notched, the edges entire, the base slightly cuneate; both surfaces glabrous, the nerves and reticulations rather distinct when dry; length 1·25 to 2·5 in., breadth ·6 to 1·2 in.; petiole ·2 to ·3 in. puberulous. *Flowers* ·35 to ·5 in. in diam., in lax axillary racemes or cymes, the pedicels puberulous, slender, longer than the flowers; buds sub-globose or obovate. *Calyx* irregularly lobed, glabrous, the edges scarious. *Petals* oblong, obtuse, ·3 to ·4 in. long. *Stamens* 8, or fewer; the filaments broad and united into a tube, their apices free and filiform, the anthers ovate. *Ovary* sessile, on a small annular disc. *Berries* ovoid at first, globose when ripe, ·6 to ·8 in. in diam. Hook. fil. Fl. Br. Ind. I, 511: Miq. Fl. Ind. Bat. I, Pt. 2, p. 519; Kurz For. Flora Burmah I, 195: DC. Prod. I, 535; W. and A. Prodr. 91; Wight Ill. I, 108; Wall. Cat. 6353; Oliv. in Journ. Linn. Soc. v. Suppl. II, 24: Dalz. and Gibs. Bomb. Flor. 28. *A. floribunda*, Wight, Ic. t. 1611. *A. platistigma*, Wight Ill. I, 108. *Limonia monophylla*, Linn.; Roxb Cor. Pl. I, t. 82; Fl. Ind. II, 378. *Turræa virens*, Hellen. in Act. Holm. 1788, t. 10, f. I, (not of Linn.). *Trichilia spinosa*, Willd.; DC. Prodr. I, 623. Rheede Hort. Mal. IV, t. 12; Burm. Fl. Zeyl. t. 65, f. I.

Penang, Kedah, Andaman and Nicobar Islands. DISTRIB.—British India, in Sylhet, and in the Peninsula, Ceylon.

The plant named *A. macrophylla* by Kurz (For. Fl. Burmah I, 195), of which there are excellent specimens in the Calcutta Herbarium, seems to be only a luxuriant form of this. I can find no characters in which it differs, except size.

2. ATLANTIA ROXBURGHIANA, Hook. fil. (not of Oliver), Fl. Br. Ind. I, 513. A glabrous shrub or small tree: young branches slender, spineless. *Leaves* thinly coriaceous, elliptic or elliptic-oblong, tapering to each end, the apex sub-acute or shortly acuminate; the base cuneate, rarely rounded; main nerves 10 to 14 pairs, spreading, slightly prominent underneath when dry; length 4 to 6 in., breadth 1·75 to 2·25 in., petiole ·3 in. *Racemes* short, few-flowered, axillary. *Flowers* nearly ·5

in. in diam., buds globose. *Calyx* with 4 obtuse lobes. *Petals* 4, obovate. *Stamens* 8; the anthers oblong-ovoid; filaments free, short, subulate. *Ovary* ovoid, sessile, 2-celled. *Berry* globose when ripe, glabrous, ·6 to ·8 in. in diam. Hook. fil. Fl. Br. Ind. I, 513. *Sclerostylis Roxburghii*, Wight, Ic. t. 72. *Amyris simplicifolia*, Roxb. Fl. Ind, II, 244.

Perak: common. Penang, Malacca; Griffith (Kew Distrib.) No. 537.

There are in the Calcutta Herbarium a large number of fruiting specimens of this from Perak; but not a single one in flower. These specimens agree so entirely with Roxburgh's figure of *Amyris simplicifolia* in the Calcutta Herbarium (of which Wight's Ic. 72 is a copy) and with Griffith's Malacca specimen (No 537), that I have no hesitation in referring them to the same species. The description of the flowers given above is copied from Sir Joseph Hooker's Fl. Br. Ind. I, 513.

Order XXIV. SIMARUBEÆ.

Trees or shrubs, usually with bitter bark. *Leaves* alternate, often large, pinnate or rarely simple; stipules 0 or deciduous. *Inflorescence* axillary, racemose, paniculate or cymose, rarely spicate. *Flowers* usually diclinous, regular, and generally small. *Calyx* 3–5-lobed, valvate or imbricate. *Petals* 3–5, very rarely 0, hypogynous, valvate or imbricate. *Disc* annular or elongate, simple or lobed, rarely 0. *Stamens* as many or twice as many as the petals, rarely indefinite, inserted at the base of the disc; filaments free, often with a scale at the base; anthers oblong, usually introrse, 2-celled, dehiscing longitudinally. *Ovary* free, 1–6-celled, usually deeply lobed, less often entire; styles 2–5, free, or more or less united, stigmas capitate; ovules usually solitary in each cell, rarely more numerous, raphé ventral, micropyle superior. *Fruit* drupaceous, capsular, or occasionally samaroid, usually of 2–6 distinct carpels. *Seeds* usually solitary, erect or pendulous, albuminous; embryo straight or curved, radicle superior.—Distrib. Tropical and subtropical regions of both hemispheres; genera 30; species about 130.

Ovary deeply 4- or 5- lobed; fruit separating into cocci; leaves pinnate.
- Stamens 8 to 10, filaments with dilated ciliate bases ... ... 1. *Harrisonia.*
- Stamens 4.
  - Disc entire: flowers in branching panicles; leaves glabrous ... 2. *Picrasma.*
  - Disc 4-lobed; flowers in small cymes, collected in long narrow panicles; leaves pubescent ... ... 3. *Brucea.*

Stamens 5; disc 5-lobed; flowers in long much-branched panicles; leaves glabrous ... ... 4. *Eurycoma.*

Ovary not lobed; fruit not separating into cocci; leaves simple ... ... 5. *Irvingia.*

1. HARRISONIA, Brown.

Glabrous spiny shrubs. *Leaves* unequally pinnate or 1-foliolate. *Flowers* hermaphrodite, in bracteate cymes. *Calyx* small, 4–5-fid. *Petals* 4–5, longer than calyx. *Disc* hemispherical. *Stamens* 8–10, dilated at the base. *Ovary* globose or 4–5-lobed, 4–5-celled; styles connate or distinct at the base; ovules solitary, pendulous. *Fruit* a small globose berry. *Seed* solitary, sparingly albuminous.—Distrib. Tropics of Old World and of Australia. Species 3-4.

1. Harrisonia Brownii, A. Juss. in Mem. Mus. Par. XII, 517, 540, t. 28. A shrub; young branches slender, glabrous, lenticellate, often armed with sharp conical prickles usually in pairs. *Leaflets* 3, ovate to rhomboid, acuminate, coarsely serrate; the terminal one the largest, petiolulate, and much narrowed at the base; the two lateral sessile and slightly narrowed; length from ·6 to 1 in. *Flowers* 1 to 3, when expanded ·3 in. long, tetramerous, from small axillary tubercles on slender pedicels from ·5 to ·75 in. long, buds globose. *Petals* lanceolate, reflexed. *Stamens* 8, erect, as long as the petals; filaments with dilated concave hairy bases, anthers ovate. *Ovary* deeply 4-lobed, 4-celled, glabrous. *Fruit* pisiform, depressed, 3–2- or even 1-celled by abortion, each cell one-seeded; pericarp coriaceous, glabrous. Planch. in Hook. Lond. Journ. Bot. V. 569; Benth. Fl. Austral. I, 376.

S. Andaman: Kurz, King's collectors. Distrib.—Timor., N. Australia. Philippines.

2. Picrasma, Blume.

Trees or shrubs with bitter properties. *Leaves* unequally pinnate. *Flowers* small, declinous or polygamous, in axillary panicles. *Calyx* very small, 4–5 toothed. *Petals* 4–5, valvate, very often increasing after flowering. *Disc* thick, entire. *Stamens* 4–5, not scaly, hairy. *Ovary* 3–5-partite, free; style distinct at the base and apex, but united in the middle, stigmas simple; ovules erect, solitary. *Fruit* of 1–3 fleshy or coriaceous drupes. *Seed* erect, albuminous.—Distrib. India, Malay Archipelago, China, Japan, West Indies, Brazil. Species about 4.

1. Picrasma javanica, Blume, Bijdr, 248. A tree 30 to 60 feet high; young branches glabrous, dark-coloured, rather slender. *Leaflets* 3 to 7, membranous, elliptic-oblong, elliptic-lanceolate or elliptic, more or less

acuminate or caudate-acuminate, the edges entire or (especially in old leaves) thickened and minutely undulate, the base narrowed or rounded; both surfaces glabrous; main nerves 4 to 6 pairs, ascending, curved, rather prominent and pale beneath in adult leaves. *Panicles* axillary, on long peduncles, branching. *Flowers* numerous, crowded at the extremities of the branchlets, 4-merous, ·15 to ·25 in. in diam. *Sepals* broadly ovate, spreading, pubescent, minute. *Petals* much larger than the sepals, ovate, concave, nerved, puberulous. *Stamens* 4; the filaments pubescent in the male, villous in the female flower. *Ovary* deeply 4-lobed, puberulous; the disc entire, woolly. *Style* single; stigmas 4, reflexed. *Fruit* of 1 to 3 sub-globular coriaceous drupes seated on the enlarged disc, and surrounded by the enlarged coriaceous curved petals. Benn. Plantae Javan. Rarior. 197. t. 41; Planch. in Hook. Lond. Journ. Bot. V, 573; Hook. fil. Fl. Br. Ind. I, 520; Kurz for Flor. Burma, I. 201. *P. nepalensis*, Benn. in Wall. Cat. sub No. 8506. (Lith. Cat. p. 287); Pl. Jav. Rar. 201; Planch. in Hook. Journ. Bot. V, 573. *P. andamanica*, Kurz Andam. Rep. App. IV; Hook. fil. Fl. Br. Ind. I, 520; *Brucea?* Wall. Cat. 7499. *B. dubia*, Steud. Nomencl. Wall. Cat. *indeterminata*, No. 9037.

Malacca, Perak, Andamans. Distrib.—Malayan Archipelago, sub-Himalayan tracts, Assam, Khasia Hills and Burmah, in British India.

I can find nothing to distinguish *P. nepalensis* Benn. and *P. andamanica*, Kurz from *P. javanica*, Blume. In fact Kurz himself reduced his species *P. andamanica* to *P. javanica;* and in his latest book (The Flora of British Burmah), he does not give the name *P. andamanica*, which was in fact originally published in a hastily prepared official report. And, as for *P. nepalensis*, Benn.—its author declares in his original description of it, that it differs from *P. javanica*, Bl., only by having sometimes as many as seven leaflets, and in their being more acuminate than is usual in specimens from Java.

3. Brucea, Mill.

Bitter trees or shrubs. *Leaves* large, unequally pinnate. *Flowers* in minute, numerous, very small cymes, collected into long narrow axillary panicles. *Calyx* minute, 4-partite, imbricate. *Petals* 4, minute, linear, imbricate. *Disc* 4-lobed. *Stamens* 4, inserted beneath the disc, filaments naked. *Ovary* 4-lobed, or consisting of 4 entirely free carpels. *Drupes* 4, entirely free, ovoid, somewhat fleshy. *Seed* solitary, exalbuminous.—Distrib. Tropics of Old World and of Australia. Species 6.

1. Brucea sumatrana, Roxb. Fl. Ind. I., 449. A shrub 4 to 6 feet high; young branches rather stout, tawny-pubescent. *Leaflets* about

9, membranous, lanceolate, acuminate, very coarsely dentate-serrate; the base oblique, acute, or obtuse; both surfaces, but especially the lower, softly yellowish-pubescent, 1·5 to 3·5 in. long (the whole leaf from 10 to 14 in. long), petiolule ·15 to ·25 in. long. *Panicles* often as long as the leaves, very narrow. *Flowers* minute, purple, in short distant cymules; the sepals smaller than the petals, both pubescent. *Stamens* about as long as the petals, the filaments short. *Drupes* black when ripe, oval, glabrous, ·15 to ·2 in. long. DC. Prod. II, 88; Wall Cat. 8482; Blume Bijdr., 1167; Planch. in Hook. Lond. Journ. Bot. v., 575; Hook. fil. Fl. Br. Ind. I, 523; Kurz For. Flora, Burma, I, 202.

In all the provinces except the Andaman and Nicobar Islands.—DISTRIB. Malayan Archipelago, British India.

4. EURYCOMA, Jack.

Shrubs or small trees, with bitter bark. *Leaves* very large, unequally pinnate, with entire glabrous leaflets. *Flowers* polygamous, in much-branched sub-terminal glandular-hairy panicles. *Calyx* minute, 5-toothed, valvate. *Petals* 5, induplicate-valvate. *Disc* consisting of 5 glands alternating with the stamens. *Stamens* in male and hermaphrodite flowers 5, smaller in the latter; filaments attached to the base of the petals. *Ovary* 5-partite, free; styles 5, connate, stigmas distinct. *Drupes* 3–5, stipitate. *Seed* solitary, pendulous, exalbuminous.—DISTRIB. Malaya, Philippines. Species 2.

Branches 1 in. thick, rusty-pubescent; petals ·25 in. long, thick, pubescent on both surfaces — 1. *E. longifolia.*

Branches ·25 in. thick, glabrous, pale; petals ·35 in. long, thin, glabrous inside ... — 2. *E. apiculata.*

1. EURYCOMA LONGIFOLIA, Jack Roxb. Fl. Ind. ed. Carey, II, 307. A shrub or small tree; young branches about 1 in. in diam., densely rusty-tomentose, with large cicatrices. *Leaves* 18 to 24 in. long; the leaflets numerous, coriaceous, oblong-lanceolate, acute, entire; the base oblique, cuneate; both surfaces glabrous, the upper shining; length 3 to 4 in., breadth ·75 to 1 in. *Panicles* usually shorter than the leaves, much-branched, many-flowered, clothed (especially in the younger parts) with rufous glandular hairs. *Calyx* much shorter than the corolla, the segments ovate, spreading. *Petals* thick, erect, ovate-lanceolate, purple, pubescent, slightly glandular in the upper half outside, ·25 in. long. *Stamens* longer than the calyx, alternating with 5 rather large bilobed ciliate glands which are large in the male and small in the hermaphrodite. *Fruit* of 1 to 5, stipitate, narrowly ovoid, apiculate, ridged drupes, ·5 in. long and ·25 in. diam.; the pericarp coriaceous, purple, glabrous. DC. Prodr. ii. 86; Wall. Cat. 8522; Planch. in Hook. Lond. Journ.

Bot. v. 584. *E. merguensis*, Planch. l. c.; *E. tavoyana*, Wall. Cat., 8523; Hook. fil. Fl. Br. Ind. I, 521; Kurz For Flora Burmah. I, 202.

In all the provinces except the Andaman and Nicobar islands. Distrib.—Malayan Archipelago, Philippines, Burmah.

2. Eurycoma apiculata, A. W. Bennett in Hook. fil. Fl. Br. Ind. I, 522. A shrub or small tree; young branches about ·25 in. thick, nearly glabrous, rather pale. *Leaves* 12 to 15 in. long; the leaflets numerous, sub-coriaceous, oblong-lanceolate, shortly and rather abruptly acuminate; the base acute, very slightly oblique; both surfaces glabrous, dull; length 2·5 to 5·5 in., breadth 1 to 1·7 in. *Panicles* shorter than the leaves; the lateral branches short, slender, few-flowered, clothed, especially towards the extremities, with short, black glandular hairs. *Calyx* much shorter than the corolla, the segments sub-erect, ovate, acute. *Petals* thin, erect, linear, glabrous inside, glandular outside, ·35 in. long. *Stamens* about as long as the sepals, alternating with very minute entire glands. *Fruit* as in *E. longifolia*.

Penang: Perak, not so common as the last.

This species comes very near *E. longifolia*, Jack., the chief distinction being in the flowers. The branches are also very much thinner than those of *E. longifolia*, and they are glabrous; the panicles have shorter and fewer-flowered branches.

5. IRVINGIA, Hook. f.

Glabrous insipid trees. *Leaves* simple, coriaceous, entire, with deciduous stipules. *Flowers* hermaphrodite, in axillary panicles, ebracteate. *Calyx* small, 4–5-partite, imbricate. *Petals* 4–5, imbricate. *Disc* very large, cushion-shaped. *Stamens* 10, inserted beneath the disc, filaments long, slender. *Ovary* conical, compressed, 2-celled, entire; style simple, terminal; ovules solitary. *Fruit* drupaceous, large, with 1 pendulous exalbuminous seed. Four species—3 Tropical African, and 1 Malayan.

1. Irvingia malayana, Oliver ex Hook. fil. Fl. Br. Ind. I, 522. Young branches glabrous, striate. *Leaves* coriaceous, glabrous, elliptic, acute, entire, the base rounded; main nerves 14 to 16 pairs, spreading, curved, inconspicuous: length 3·5 to 5·5 in., breadth 1·75 to 2·4 in., petiole ·6 to ·7 in. *Panicles* axillary, little-branched, shorter than the leaves. *Flowers* small, hermaphrodite. *Calyx-lobes* ovate, obtuse. *Petals* twice as long as the calyx and equal to the stamens, reflexed after flowering. *Disc* large, bearing the conical ovary in the middle of it. *Fruit* a glabrous compressed drupe, 2 in. long and nearly 1·5 in. in diam.

Malacca; Maingay (Kew Distrib.) No. 468.

Order XXV. OCHNACEÆ.

Glabrous trees or shrubs. *Leaves* alternate, simple, (very rarely pinnate) coriaceous; stipules 2. *Inflorescence* panicled or occasionally umbellate (rarely flowers solitary), bracteate. *Flowers* hermaphrodite, conspicuous. *Sepals* 4–5, free, imbricate, persistent. *Petals* 5, rarely 4 or 10, free, hypogynous, imbricate, longer than the sepals, deciduous. *Disc* enlarged after flowering, occasionally 0. *Stamens* 4, 5, 8, 10, or indefinite, inserted on the disc, filaments persistent; anthers basifixed, sometimes deciduous, dehiscing longitudinally, or often opening by terminal pores. *Ovary* short, 2-celled, or elongate and 1–10-celled; placenta axile or parietal; style simple, subulate, acute, rarely divided at the extremity, stigmas simple, terminal; ovules 1–2 in each cell, or indefinite, ascending or rarely pendulous, raphe ventral, micropyle superior. *Fruit* indehiscent, drupaceous or baccate, compound; each drupe or pyrene 1–4 seeded; or capsular and 1–5-celled with septicidal dehiscence. *Seeds* solitary, few or numerous; albumen fleshy or 0; embryo straight or rarely curved, radicle superior or inferior.—Distrib. Tropical regions of both hemispheres, but chiefly American. Species about 160.

Tribe 1. Ochneæ. *Ovary* 2–10-celled; ovules solitary in each cell. *Seeds* exalbuminous.

Stamens ∞ ; flowers paniculate ... ... 1. *Ochna.*
Stamens 10; flowers paniculate or umbellate 2. *Gomphia.*
Sepals, petals, and stamens 4 ... ... 3. *Tetramerista.*

Tribe 2. Euthemideæ. *Ovary* imperfectly 5-celled; ovules 2 in each cell. *Seeds* albuminous.

Stamens 5; with alternate staminodes ... 4. *Euthemis.*

1. Ochna, Linn.

Glabrous trees or shrubs. *Leaves* alternate, simple, serrate, rarely entire, 2-stipulate. *Flowers* large, yellow, in bracteate panicles or umbels. *Sepals* 5, coloured, persistent. *Petals* 5–10, deciduous. *Disc* thick, lobed. *Stamens* ∞, shorter than the petals, filaments short or elongated; anthers opening longitudinally, deciduous. *Ovary* deeply 3–10-lobed, lobes 1-celled; styles entirely connate or distinct at the apex; ovules solitary in each cell, axile. *Fruit* 3–10 drupes, seated on the broad disc. *Seed* erect, albuminous.—Distrib. Tropical Asia and Africa. Species about 28.

1. Ochna Wallichii, Planch. in Hook. Lond. Journ. Bot. V, 650. A small tree, with elliptic or elliptic-oblong, sub-crenate, sub-serrate or entire, acute leaves, with cuneate or sub-rounded bases; the main nerves sub-horizontal, faint; length 3 to 5·5 in.; breadth 1·5 to 2·5 in.;

petiole ·15 to ·2 in. *Stipules* very minute. *Flowers* 1·5 in. in diam., in short lateral panicles, the pedicels 1 in. or more in length. *Sepals* ovate or lanceolate, usually reflexed in fruit. *Petals* larger than the sepals. *Anthers* linear, deciduous, shorter than the filiform persistent filaments. *Styles* longer than the stamens, cuneate to the apex, or the apices free and spreading. *Drupes* ovoid, about ·5 in. long. Hook. fil. Fl. Br. Ind. (excl. syn. *O. stipulacea*, Colebr. MSS.). *O. nitida*, Wall. Cat. 2894 (not of Thunbg.); Planch. in Hook. Journ. Bot. V, 653; Kurz For. Fl. Burm. I, 205. *O. squarrosa*, Kurz Andaman Report IV (not of Linn.). *O. andamanica*, Kurz Andam. Rep. Ed. II, 33; Journ. As. Soc. Bengal, for 1872, pt. 2, 295; For. Flora Burm. I, 205. *O. obtusata*, DC. Wall. Cat. 2805, B.

Andaman Islands.—Distrib. Burmah.

Kurz distinguished his species *O. andamanica* by the styles being free and spreading at their apices, while the fruiting sepals are reflexed. But I do not find that these two characters are at all constantly associated. In other respects, Kurz's characters of *O. Wallichii*, and *O. andamanica* are identical. *O. stipulacea*, Colebr., reduced to this by Mr. A. W. Bennett, in Fl. Br. Ind., appears to me to be distinct.

2. Gomphia, Schreb.

Glabrous trees or shrubs. *Leaves* alternate, shining, 2-stipulate. *Flowers* yellow, in axillary or terminal racemes or umbels. *Sepals* 5, coloured, persistent. *Petals* 5, imbricate. *Disc* thick, lobed. *Stamens* 10, inserted at the base of the disc, filaments very short, anthers opening by terminal pores. *Ovary* deeply 5–6-lobed, lobes 1-celled; styles connate, stigma simple; ovules solitary in each cell, erect. *Drupes* 5 or fewer, seated on a broad disc, 1-seeded. *Seed* erect, exalbuminous.—Distrib. Chiefly tropical South American: a few in Asia and Africa. Species about 80.

Flowers in diffuse panicles	...	...	1. *G. sumatrana.*
Flowers in corymbs ...	...	...	2. *G. Hookeri.*

1. Gomphia sumatrana, Jack in Mal. Misc. No. 5, p. 29; Hook. Bot. Misc. II., 77. A tree 22 to 40 feet high; young branches slender, pale. *Leaves* coriaceous, narrowly elliptic-oblong, tapering to each end, the edges serrulate or sub-entire; main nerves numerous, sub-horizontal, very faint, as are the reticulations; intramarginal nerves from base to apex, two or three, rather distinct when dry; length 3·5 to 7 in., breadth 1·15 to 2·25 in., petiole ·15 in. *Panicles* terminal, longer than the leaves, branching. *Flowers* numerous, ·35 in. in diam. *Sepals* narrowly ovate, veined. *Petals* larger than the sepals, broad, retuse and inflexed at the apex. *Anthers* linear, much longer than

the short filaments. *Ovaries* 5 ; styles longer than the stamens, quite connate. *Ripe carpels* obovate or reniform, shining. Hook. fil. Fl. Br. Ind. I, 525 ; Kurz For. Flora Burm. I, 206 ; Miq. Fl. Ind. Bat. I, pt. 2, 675 ; Wall. Cat. 2803. *G. sumatrensis*, Planch. in Hook. Ic. Pl. t. 712, and Hook. Lond. Journ. Bot. VI. 2. *Ochna crocea*, Griff. Not. IV. 463. *E ? pulcherrima*, Wall, Cat. 2518.

In all the provinces except the Nicobar and Andaman Islands: common.—Distrib. Borneo, Sumatra.

This is very near indeed to G. *angustifolia*, Vahl. ; the only differences that I can find between the two being that in this the petals are larger, with more reflexed edges, and the panicles are larger and more diffuse.

2. Gomphia Hookeri, Planch. in Hook. Lond. Journ. Bot. VI, 3. A tree ; young branches dark-coloured. *Leaves* coriaceous, ovate-oblong to oblong-lanceolate, the base narrowed ; main nerves faint, much curved upwards, no continuous intramarginal nerve ; upper surface shining, the lower dull ; length 2·5 to 6 in., breadth 1 to 2 in., petiole 1·5 to ·35 in. *Flowers* ·35 in. in diam., in lateral or terminal, crowded, minutely bracteolate umbels ; the pedicels slender, ·5 to ·7 in. long. *Sepals* lanceolate. *Petals* very deciduous, about as long as the sepals, oblong, obtuse, not narrowed at the base. *Anthers* deciduous, elongate, about as long as the slender persistent filaments. *Ovaries* 5 ; styles much longer than the stamens, quite connate. *Ripe carpels* sub-globular or obovoid, smooth, ·2 in. diam. Hook. fil. Fl. Br. Ind. I, 525.

In all the provinces except the Nicobar and Andaman Islands.

In the flowers of different individuals, the disc varies in thickness, being in some as thick as the ovaries are long, while in others it is comparatively shallow.

Var. *corymbosa ;* flowers in corymbs, which are sometimes compound ; the lengthened rachis of the inflorescence rough from the transverse cicatrices of the fallen bracts ; shrubby.

3. Tetramerista, Miq.

Shrubs or trees. *Leaves* very large, coriaceous, entire. *Flowers* in axillary racemes with large foliaceous bracts. *Sepals* 4, imbricate, persistent. *Petals* 4, persistent. *Stamens* 4, the filaments with dilated bases, the anthers with sutural dehiscence. *Ovary* 4-angled, 4-celled, the style entire. *Fruit* baccate, globose ; the pericarp leathery.—Distrib. Malaya. Species 1 or 2.

1. Tetramerista glabra, Miq., Fl. Ind. Bat. Suppl., 534. A glabrous tree 30 to 50 feet high ; young branches stout, with shining, rather pale bark. *Leaves* narrowly obovate or oblanceolate, sub-sessile,

the apex obtuse ; the base much narrowed, minutely sagittate ; upper surface shining, the lower dull, chocolate-coloured when dry ; main nerves numerous, sub-horizontal ; length 5 to 10 in., breadth 1·25 to 2·75 in., petiole under ·1 in. *Flowers* 1 in. in diam., in long-pedunculate axillary umbellate racemes ; pedicels about ·5 in. long, each with a sepal-like bract near the flower. *Sepals* coriaceous, oblong, obtuse. *Petals* linear-lanceolate, about as long as the sepals and reflexed like them. *Stamens* elongate, shorter than the reflexed filaments. *Ovary* ovoid, obscurely 4-angled. *Style* single, stigma minute. *Ripe fruit* ovoid-globose, 1·25 to 1·5 in. long, sub-glabrous, the calyx and corolla persistent ; the pericarp thick, fleshy. Bennett in Hook. fil. Fl. Br. Ind. I, 526. *Ancistrocladus ? sagittatus*, Wall. Cat. 1055.

Singapore ; Wallich. Perak : Wray, Scortechini, King's collector. Distrib. Sumatra.

4. Euthemis, Jack.

Glabrous shrubs. *Leaves* alternate, simple, shining, coriaceous, serrulate, with ciliate deciduous stipules. *Flowers* rose or white, in terminal or leaf-opposed racemes or panicles, bracteate. *Sepals* 5, imbricate, persistent or deciduous. *Petals* 5, longer than sepals, imbricate. *Disc* small, conical. *Stamens* 5, inserted at the base of the disc, with alternate staminodes, anthers opening by terminal pores. *Ovary* semi-5-celled, elongate, viscid ; style 1, stigma entire ; ovules 1–2 in each cell, pendulous. *Fruit* a berry of 5 pyrenes, each 1–2-seeded. *Seeds* pendulous with a fleshy albumen.—Distrib. Species 4 ; all Malayan.

Leaves spinulose-serrate ; fruit white ... 1. *E. leucocarpa.*
Leaves nearly entire ; fruit red ... ... 2. *E. minor.*

1. Euthemis leucocarpa, Jack in Mal. Misc. No. V., p. 16. A shrub 2 to 5 feet high : young branches rather stout, pale, glabrous, lenticellate. *Leaves* oblong-lanceolate, tapering to each end, the edge thickened inside the numerous spinulose serrations ; main nerves very numerous, curved at first, then sub-horizontal, indistinct ; length 3·5 to 8 in., breadth 1·2 to 2 in. ; petiole ·5 to 1·5 in., winged. *Flowers* ·6 or ·7 in. in diam, shortly pedicelled, generally in pairs ; bracts ovate, acute. *Sepals* ovate, obtuse, ciliate, the two inner rather smaller. *Petals* longer than the sepals, oblong-ovate, obtuse, reflexed. *Anthers* erect, connivent, subsessile, oblong, acuminate at the apex, style filiform ; stigma small, simple. *Berry* snow-white, sub-globular, ·2 to ·35 in. in diam., obscurely angled, mesocarp spongy. Roxb. Fl. Ind. (ed. Carey), II, 303 ; Planchon in Hook. Ic. Plant. t. 711. Bennett in Hook. fil. Fl. Br. Ind. I, 526 ; Miq. Fl. Ind. Bat. Pt. 2 p. 675.

In all the provinces except the Andaman and Nicobar islands. Distrib. Malayan Archipelago.

2. Euthemis minor, Jack in Mal. Misc. No. V, p. 18. A small shrub, similar to the last, but with nearly entire, sub-acute, obscurely-veined leaves, and red fruits. Roxb. Fl. Ind. (ed. Carey), ii, 304; Bennett in Hook. fil. Fl. Br. Ind. I, 526; Miq. Fl. Ind. Bat. I, Pt. 2, p. 675.

Penang and Singapore.—Distrib. Malayan Archipelago.

I give Penang and Singapore as localities for this species, on the authority of Hooker's Flora of British India. It is, however, now probably extinct in both; and I have seen no specimens from any locality nearer to them than the island of Bangka. In Jack's time, this plant appears to have been common enough in Singapore. The plant named *Euthemis elegantissima*, by Wallich, although doubtfully placed in this genus by its author, has leaves very like those of *E. leucocarpa;* but the main nerves curve in a very different manner. Wallich never found it in fruit; but in his day plants of it were common in Singapore and the neighbouring small islands. This too appears now to be extinct. The reduction of *E. elegantissima* to *Gomphia sumatrana*, Planch, which was first suggested by Planchon, is in my opinion quite wrong, the leaves of the two being very different.

Order XXVI. BURSERACEÆ.

Trees or shrubs, mostly resiniferous. *Leaves* alternate (very rarely opposite), imparipinnate or trifoliolate, stipulate or ex-stipulate. *Inflorescence* racemose or paniculate. *Flowers* regular, small, hermaphrodite or often polygamous. *Calyx* free, 3–6-lobed, imbricate or valvate, often minute. *Petals* 3–6, distinct, rarely connate, imbricate or valvate. *Disc* annular or cupular, or absent, usually conspicuous, free, or adnate to the calyx. *Stamens* as many or twice as many as petals, inserted at the base or margin of the disc, equal or unequal; filaments free or connate at the base, smooth; anthers dorsifixed, rarely innate, 2-locular, dehiscing longitudinally. *Ovary* free, rarely 1-, more often 2–5-celled; style simple, stigma undivided or 2–5-lobed; ovules 2, or rarely 1 in each cell, anatropous, usually pendulous, rarely ascending, micropyle superior, raphe ventral. *Fruit* drupaceous, indehiscent with hard putamen, or separating into 2–5 pyrenes, rarely pseudo-capsular and dehiscent. *Seeds* solitary, usually pendulous, testa membranous, albumen 0; cotyledons usually membranous, contortuplicate, rarely fleshy and plano-convex, radicle superior.—Distrib. Tropical regions of both hemispheres; genera 15 to 19. Species about 250.

Calyx, corolla, and stamens 5-merous.

Fruit hard, woody, 3-winged, separating into 3 indehiscent pyrenes ... 1. *Triomma.*

Flowers 3-merous.

Flowers polygamous, dimorphorus. Fruit ellipsoid, more or less trigonous, with terminal style; endocarp bony, 1-3-celled, usually 1-seeded ... ... 2. *Canarium.*

Fruit obliquely globose, 1-celled, 1-seeded. Calyx keeled, the segments large, connivent ... ... 3. *Trigonochlamys.*

Flowers hermaphrodite, homomorphous. Fruit ellipsoid or sub-globose, with the stigmatic scar lateral or basal, more or less compressed on two sides, rounded on the third; endocarp rarely bony or woody, 1-celled, 1-seeded ... ... 4 *Santiria.*

1. Triomma, Hook. fil.

A tree. *Leaves* alternate, exstipulate, imparipinnate ; the leaflets few, opposite, petiolulate. *Flowers* very small, in terminal panicles, polygamous. *Calyx* 5-fid. *Petals* 5, small, valvate ? *Stamens* 10 (?) inserted at the base of the 5-lobed disc. *Ovary* trigonous, 3-celled, style short, ovules 2 in each cell. *Fruit* 3-winged, 3-valved, as much as 2–2½ inches long, containing 3 hard woody separable pyrenes.—Distrib. A solitary species.

1. Triomma malaccensis, Hook. f. in Trans. Linn. Soc. XXIII. 171 ; leaflets oblique, ovate-lanceolate, acuminate, entire ; drupe ovate-caudate, acutely cuspidate, 2·5 in. long by 2 in. broad : Bennett in Hook. fil. Fl. Br. Ind. I, 528. *Arytera ? macrocarpa*, Miq. Fl. Ind. Bat. Suppl. 199.

Malacca : Griffith, Maingay.

There is an authentic specimen in the Calcutta Herbarium of Miquel's *Arytera* ? *macrocarpa*, collected by Teysmann in the Lampongs, Eastern Sumatra. There is no doubt whatever of its identity with this.

2. Canarium, Linn.

Reziniferous trees. *Leaves* alternate, imparipinnate, stipulate or exstipulate. *Flowers* bracteate, in terminal or axillary panicles or racemes, dimorphous, polygamous ; those with fertile stamens and rudimentary ovaries being smaller, but in larger inflorescences ; those with fertile ovary having rudimentary stamens, being larger, but in smaller inflorescences. *Calyx* campanulate, 3-lobed or 3-fid, valvate. *Petals* 3, imbricate below or valvate, usually exceeding the calyx. *Stamens* 6, distinct, inserted on margin or outside of disc, or filaments confluent below and disc absent. *Ovary* 3-celled ; ovules 2 in each

cell; style various, or stigma subsessile, capitate. *Drupe* usually ellipsoidal, more or less distinctly trigonous, with a 1–3-celled, 1–3-seeded stone; cotyledons often partite, contortuplicate. Distrib. Tropical Asia, chiefly in Malaya. Species probably about 90.

The genera *Santiria* and *Canarium* are not separated from each other by any bold, well-marked distinction. As regards the Indian species of both genera, I find the following characters the most diagnostic :—

Canarium.	Santiria.
Calyx cupular or campanulate.	*Calyx* cupular, never campanulate, sometimes quite flat.
Petals longer than broad, slightly narrowed to the base.	*Petals* rotund, with very broad truncate bases.
Disc small, annular, or thin and cupular, or represented only by the tube formed by the united filaments.	*Disc* large, cupular, fleshy, often corrugated.
Filaments dilated at the base and sometimes united into a tube.	*Filaments* dilated at the base, but never united into a tube.
The flowers with fertile anthers (practically the male flowers) smaller than those with fertile ovaries, but in larger inflorescences.	*Flowers* all hermaphrodite and uniform, as are the inflorescences.

In the majority of the species of *Canarium* in which the filaments are united into a tube, I can find no other disc than that tube.

The genus *Trigonochlamys* is also closely allied to *Canarium* and *Santiria*, being distinguished from both by its much larger calyx, depressed-globose ovary, and spherical drupe. In fact the characters of the three genera so overlap each other, that, in my opinion, they must either be kept distinct by characters more or less minute, as Messrs. Bentham and Hooker have done, or united into a single genus. Dr. Engler steers a middle course; he keeps up *Canarium* and *Santiria*, but unites *Trigonochlamys* with the latter, dividing *Santiria* into three sections: (1) *Icicopsis*, with one species (*S. Planchoni*); (2) *Trigonochlamys*, with four species; and (3) *Eu-santiria* with 22 species. The section *Icicopsis* contains one 3-androus plant, which, as it has the dimorphous flowers and inflorescence of *Canarium*, I have transferred to that genus. I admit that the drupes of the plant in question more resemble those of *Santiria* than of *Canarium*: but, in the majority of its characters, it appears to me to agree better with the latter genus. As regards Dr. Engler's section *Trigonochlamys*, it is difficult to see how *Canarium* and *Santiria* are to be kept distinct as genera, if the four

plants which form this section are to be included under *Santiria*; for the flowers of *Trigonochlamys* are really more like those of *Canarium* than of *Santiria*. The separation of *Canarium* from *Santiria* by characters taken from the drupe, in my opinion, fails. The drupe of *Canarium* is defined as 1 inch or more in length, ovoid or oblong-ovoid, never gibbous, boldly trigonous, its sides equal and its endocarp hard thick and strong, 3-to 1-celled, and the scar of the style apical; while that of *Santiria* is usually less than 1 in. long, shortly and obliquely ovoid or sub-globose, often gibbous, the endocarp being thin, coriaceous, sub-ligneous, never bony, 1-celled, and the scar of the style lateral and often approximated to the base. Unfortunately several species from Perak (which in other respects have the *facies* of *Santiria*) have the style-scar quite terminal; while, on the other hand, some species with many of the characters of *Canarium* have drupes of which the endocarp is not more bony than that of several species of *Santiria*. The characters drawn from the flower, which I have given above, do not appear to me to have hitherto had sufficient value attached to them.

By transferring *Santiria Planchoni*, Benn. to *Canarium;* by keeping up *Trigonochlamys* as a genus characterised by its very large calyx, and globose drupe; and by restricting *Santiria* to the plants which form the section *Eu-santiria* of Engler, I venture to think that the study of all the plants concerned will be simplified.

Stamens 3.

Leaves sub-coriaceous with bluntly acuminate apices and 10 to 14 pairs of main nerves, flowers ·1 in. long, drupes ·4 to ·5 in. long ... ... 1. *C. Planchoni.*

Leaves coriaceous, with caudate-acuminate apices and 7 to 9 pairs of main nerves; flowers ·2 in. long; drupes 2 to 2·25 in. long ... ... 2. *C. caudatum.*

Stamens 6.

Filaments united into a tube.

Leaflets glabrous on both surfaces.

Leaflets 5 to 9 with 7 or 8 pairs of nerves; panicles terminal ... 3. *C. parvifolium.*

Leaflets 11 to 17, with 12 to 19 pairs of nerves; panicles axillary ... 4. *C. euphyllum.*

Leaflets more or less hairy.

Leaflets 7 to 9, sparsely pubescent on the lower surface when young, main nerves 10 or 12 pairs; panicles axillary ... ... 5. *C. grandiflorum.*

Leaflets sparsely hispid on both surfaces when young; glabrous, except the hispidulous nerves, when adult; panicles hispidulous ... ... 6. *C. pilosum.*

Leaflets sparsely hispidulous on the upper surface, their under surface and the inflorescence rufous-pubescent or tomentose ... ... 7. *C. hirtellum.*

Leaflets with the midrib tomentose on the upper surface, the whole of the under surface and the panicles rufous-tomentose ... ... 8. *C. rufum.*

Leaflets glabrous on the upper surface, the lower glaucescent, with a few scattered hairs; panicles rusty-tomentose ... ... 9. *C. purpurascens.*

Filaments free.

Leaflets quite glabrous on both surfaces; petals puberulous outside.

Stipules persistent.

Stipules elliptic-oblong, entire ... 10. *C. commune.*

Stipules pectinately lobed ... { 11. *C. coccineo-bracteatum.*

Stipules (if any) deciduous ... 12. *C. Manii.*

Leaflets glabrous or nearly so on both surfaces, petals rusty-pilose or pilose outside ... ... 13. *C. Kadondon.*

Leaflets with the midrib and nerves puberulous on the lower surface.

Leaflets not glaucous beneath, entire; drupe less than 1 in. long ... 14. *C. rubiginosum.*

Leaflets glaucous beneath, at least when young.

Leaflets crenulate or sub-crenulate; drupes 1 in. long ... 15. *C. Kunstleri.*

Leaflets obscurely and minutely crenate or serrate, drupes about 2 in. long ... 16. *C. glaucum.*

Leaflets rusty-tomentose or pubescent on the lower surface, the midrib tomentose on the upper ... ... 17. *C. secundum.*

Of doubtful position.

Male flowers unknown, but probably near *C. parvifolium* ... ... 18. *C. nitidum.*

1. Canarium planchoni, King, A tree, 50 or 60 feet high; young branches glabrous, cinereous. *Leaves* 5 to 10 in. long, stipules deciduous. *Leaflets* 7 to 13, thinly coriaceous, oblong-lanceolate or elliptic-oblong, shortly and bluntly acuminate; the base rounded, slightly oblique; both surfaces glabrous, the upper pale when dry and the nervation obsolete, the lower brown with the 10 to 14 pairs of sub-horizontal nerves slightly prominent; length 2 to 4 in., breadth ·9 to 1·5 in.; petiolules ·15 to ·3 in., the terminal one longer. *Panicles* numerous, slender, axillary, much shorter than the leaves, pale puberulous; the branches distant, ascending, the small flowers crowded near their apices. *Flowers* ·1 in. long, with several very minute deciduous bracteoles just beneath the calyx. *Calyx* campanulate, deeply cleft into 3 ovate, triangular lobes, tomentose outside, glabrous inside. *Petals* slightly larger than the sepals, deltoid, with a short subulate inflected apex, sub-concave, less tomentose outside than the sepals, glabrous inside. *Stamens* 3, connivent; the anthers innate, broadly ovate; filaments shorter than the anthers, flat, dilated at the base and inserted on the edge of the large cupular fleshy disc. *Ovary* in the male flowers imperfect: in the female flowers small, ovate, 3-grooved, glabrous; style terminal, short, 3-grooved, as is the stigma. *Fruit* ovoid, slightly gibbous, globular, glabrous; the persistent style slightly lateral, ·4 to 5 in. long. *Santiria Planchoni*, A. W. Benn. in Hook. Fl. Br. Ind. I, 536; Engler in De. Candolle Monegr. Phanerog. IV, 154.

Malacca: Maingay (Kew Distrib.), Nos. 315, 1972; Griffith, Nos. 1152, 1153. Perak: King's collector, No. 5573; Scortechini, No. 2097.

2. Canarium caudatum, King n. sp. A tree 20 to 40 feet high; young shoots pale brown, lenticellate, all parts except the calyx quite glabrous. *Leaves* 8 to 13 in. long, stipules (if any) deciduous. *Leaflets* 5 to 7, coriaceous, oblong to ovate, tapering to both ends, the apex caudate-acuminate, the edges entire and sometimes slightly undulate; both surfaces glabrous, shining, the reticulations distinct on the upper surface, and the 7 to 9 pairs of ascending curving interarching main nerves pale on the lower; length 3 to 6 in., breadth 1·5 in. to 2·25 in., petiolules ·4 to ·5 in., the terminal one 1·2 to 1·6 in. *Male panicles* terminal, narrowly pyramidal, few-branched, shorter than the leaves, the bracteoles (if any) deciduous. *Flowers* few, at the extremities of the branches, ·2 in., long. *Calyx* widely campanulate, the mouth with 3 broad, shallow teeth, minutely pubescent outside, glabrous inside. *Petals* longer than the calyx, imbricate, ovate, acute, the base truncate,

thickened in the middle; the edges thin, both surfaces glabrous. *Stamens* 3; the anthers oblong, shorter than the flattened filaments, the dilated bases of which are attached outside the glabrous fleshy disc from which emerges the oblong tapering rudimentary ovary: style filiform, stigma minute. *Female flowers* not seen. *Ripe drupes* narrowly ellipsoid, slightly clavate, sub-trigonous, 2 to 2·25 in. long and ·6 in. in diam.; persistent calyx small, flat, 3-angled.

Perak: King's collector, Nos. 8554, 10016, 10182, and 10227. Scortechini, No. 454.

This and the next are distinctly separated from all the other hitherto described Malayan species by their triandrous flowers. The leaves and drupes of this are also very characteristic.

3. Canarium parvifolium, A. W. Benn. in Hook. fil. Fl. Br. Ind. I. 536. A tree; young branches slender, dark brown, all parts ultimately glabrous except the flower. *Leaves* 6 to 12 in. long; leaflets 5 to 9, coriaceous, oblong-lanceolate to elliptic, acuminate, entire, the base rounded or slightly narrowed, both surfaces shining; nerves 7 or 8 pairs, spreading, invisible above (even when dry) and very faint below, length 2 to 3·5 in., breadth ·8 to 1·6; petiolules ·1 to ·2 in., the terminal one ·35 to ·65 in.; stipules (if any) deciduous. *Panicles* terminal, slender, the branches few, short, few-flowered, bracteolate. *Flowers* ·2 in. long, slightly longer than the pedicels. *Calyx* campanulate; the mouth truncate, quite entire or faintly 3-toothed. *Petals* much longer than the calyx, imbricate, elliptic, obtuse, concave, puberulous on both surfaces. *Stamens* 6, as long as the petals: anthers oblong, much shorter than the filaments which are subulate, much dilated in the lower third and very slightly united at the base. *Rudimentary ovary* ovoid, tapering into the thin cylindric style, glabrous. *Female flowers* unknown. *Ripe drupe* ellipsoid, trigonous, glabrous, 1·5 to 1·75 in. long, and ·8 in. in diam. Engler in DeCand. Monogr. Phanerog. Vol. IV, 140.

Malacca: Griffith, No. 1068; Maingay, No. 353 (Kew Distribution). Perak: King's collector, Nos. 2618 and 7870.

The bases of the filaments in Griffith's No. 1068 are less dilated than in those of Maingay's No. 353, or in those of King's collector's specimens; but in other respects the characters agree. This species in externals much resembles *C. nitidum*, Benn.

4. Canarium euphyllum, Kurz in Journ. As. Soc. Bengal, 1872, Pt. 2. p. 295. A tree 80 to 90 feet high; young shoots very stout, puberulous. *Leaves* 2 to 3 feet long, the stipules (if any) very deciduous. *Leaflets* 11 to 17, membranous, ovate, ovate-oblong or oblong, opposite, very shortly and abruptly acuminate, the edges glandular-serrulate; the base unequal, rounded or sub-cordate; both surfaces

glabrous, minutely reticulate, the upper shining; main nerves 12 to 19 pairs, spreading, rather straight, interarching very near the edge; length 4 to 10 in., the lower leaflets much the smallest; breadth 2 to 3·5 in., petiolules ·35 to ·6 in. *Panicles* shorter than the leaves, axillary, puberulous or glabrous, their branches only 1 or 2 inches long, few-flowered, sub-corymbose. *Flowers* ·4 in. long. *Calyx* shorter than the petals, tubular, cut for half its length into 3 broad blunt teeth, puberulous on both surfaces. *Petals* oblong, concave and thickened at the apex, minutely tomentose outside. *Stamens* 6, the anthers linear-oblong, shorter than the glabrous filaments which for two-thirds of their length are united into a tube; rudimentary ovary truncate, glabrous, with a few hairs on the top. *Female flowers* not seen. *Ripe drupes* ovoid-ellipsoid, not trigonous, glabrous, 1·75 in. long and ·8 in. in diam., peduncles stout; the persistent calyx 3-angled, woody. Kurz For. Flora Burmah. I, 208. A. W. Benn. in Hook, fil. Fl. Br. Ind. I, 535. Engler in DeCand. Monogr. Phanerog. IV., 123.

South Andaman: Kurz, King's collector. Burmah: in North Arakan, Hildebrand.

The leaflets on the same leaf vary much in size and shape; those towards the base being short and broad, while those towards the apex are oblong. This species is closely allied to *C. bengalense*, Roxb., but its calyx is more deeply toothed; its anthers are shorter and broader; and its leaves although very similar in texture, are longer, have thicker rachises, while the leaflets are serrate and not entire. The young branches of this are moreover nearly twice as thick as those of *C. bengalense*.

5. Canarium grandiflorum, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 533. A tree; young branches stout, pubescent, ultimately glabrous and dark-coloured. *Leaves* 9 to 12 in. long, the rachis glabrous. *Leaflets* thinly coriaceous, 7 to 9, opposite, ovate-lanceolate or elliptic-oblong, acuminate, entire, the base rounded, upper surface glabrous; the lower glabrous or sparsely pubescent, with the 10 to 12 pairs of spreading main nerves prominent; length 3 to 4·5 in., breadth 1·35 to 1·75 in.; petiolules ·2 in. long, the terminal one longer. *Male panicles* little more than half as long as the leaves, puberulous or nearly glabrous, with a few long spreading branches; the flowers few, in distant clusters, shortly pedicelled. *Calyx* shortly campanulate, with 3 broad, blunt teeth, pubescent outside, glabrous inside. *Petals* longer than the calyx, oblong, thick, concave, blunt, pubescent outside, glaberulous inside. *Anthers* linear, longer than the filaments, the latter glabrous, dilated, and forming a short tube, rudimentary ovary hairy. *Female flowers* larger than the male, in axillary racemes, or short panicles with racemose branches; the anthers short, ovate; the filaments as in the male. Ovary broadly ovoid, tapering

into the style and like it rufous-pilose; stigma capitate. *Drupe* narrowly ellipsoid, sub-trigonous, glabrous; stone thick, bony, 1·35 in. long. Engler in DeCand. Monogr. Phanerog. IV., 122.

Malacca: Maingay, (Kew Distrib.), No. 312. Singapore: Hullett No. 516.

This is an imperfectly known species. The only male flowers I have seen of it are those in Mr. Hullett's specimen from Singapore. I have seen no ripe drupes. *Canarium dichotomum*, Miq. (*Pimela dichotoma*, Blume Mus. Lugd. Bat. I, 22) closely resembles this as to leaves. But, as neither Blume nor Miquel describes its flowers, it is impossible to decide whether the likeness goes beyond externals. The specific name of this is unfortunate. The flowers described by the author of it are females, and they are not larger than the female flowers of many other species, while they are much smaller than those, for example, of *C. rufum*, Benn.

6. Canarium pilosum, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 533. A tree 30 to 60 feet high; young branches rufous-pubescent, with strigose hairs intermixed. *Leaves* 12 to 18 in. long. *Leaflets* 3 to 7, thinly coriaceous, opposite, oblong-lanceolate to elliptic, sometimes slightly obovate, shortly and abruptly acuminate, entire or obscurely crenulate; the base cuneate, slightly unequal-sided; both surfaces when young sparsely hispid, when adult almost glabrous except the midrib and 12 or 13 pairs of slightly prominent spreading nerves which are sparsely hispidulous; reticulations distinct beneath; length 4·5 to 5·5 in., breadth 1·5 to 2·5 in.; petiolules ·15 to ·25 in., the terminal one more than 1 in.; stipules in pairs, subulate, hairy. *Male racemes* axillary, about 6 in. long, hispidulous, interrupted. *Flowers* about ·5 in. long, pedicellate, few. *Calyx* much shorter than the corolla, tubular, its mouth nearly entire, minutely tomentose on both surfaces. *Petals* narrowly oblong, thickened and wider upwards, puberulous on both surfaces. *Anthers* linear, about half as long as the filaments which are linear, flattened and united into a tube for about one-third of their length; rudimentary ovary very short, rufous-pilose. *Female flowers* unknown; the fruiting racemes only about 4 in. long, nearly glabrous. *Drupes* narrowly ellipsoid, sub-trigonous, glabrous, 1 in. long, and ·5 in. in diam. (unripe). Engler in DeCandolle, Monogr. Phanerog. IV. 121. Wall. Cat. No. 8100.

Malacca: Maingay (Kew Distrib.) No. 302. Singapore: Wallich. Perak: Scortechini No. 424.

This species is very closely allied to *C. hirtellum*, the chief differences being (1) that the calyx of the male flowers of this is almost entire, while in those of *C. hirtellum*, the calyx is deeply 3-toothed; and (2)

that the leaves of this are when young hispidulous, and when adult nearly glabrous ; while those of *C. hirtellum* are more or less densely pubescent beneath at all stages.

7. Canarium hirtellum A. W. Benn. in Hook. fil. Fl. Br. Ind. I. 534. A tree 40 to 60 feet high : the young branches, rachises and under surfaces of the leaves and the inflorescence more or densely rufous-pubescent or tomentose. *Leaves* 9 to 15 in. long : *leaflets* 5 to 7, the the pairs opposite, coriaceous, elliptic, shortly and rather abruptly acuminate, entire or minutely serrulate, the base rounded or subcuneate ; upper surface shining, reticulate, sparsely hispidulous, the midrib tomentose ; main nerves 11 to 13 pairs, spreading, curving, prominent on the lower, depressed on the upper surface ; length 4 to 7 in., breadth 1·5 to 3 in. ; petiolules ·1 to ·2 in., that of the terminal one ·5 to ·75 in. *Male flowers* in axillary or terminal racemes or panicles much shorter than the leaves. *Flowers* ·4 in. long, on short stout pedicels, mostly crowded near the ends of the branchlets. *Calyx* campanulate, with 3 broad blunt teeth, tomentose on both surfaces but especially on the outer. *Petals* longer than the calyx, oblong, concave, thickened upwards, sericeous outside, glaberulous within. *Anthers* linear, about one-third as long as the glabrous flattened filaments which are united into a tube for half their length ; rudimentary ovary very small, rufous-sericeous. *Female flowers* not much larger than the males, the stamens shorter than the pistil, the free part of the filaments very short, the anthers with pubescent edges. *Ovary* broadly ovoid, densely rufous-sericeous ; the style about as long, sparsely pubescent. *Stigma* capitate, 3-lobed. *Ripe drupe* narrowly ellipsoid, trigonous, glabrous, 1 to 1·25 in. long, and ·4 to ·5 in. in diam. Engler in De Candolle Monog. Phanerog. IV, 121 ; Hooker Icones Plantar. No. 1575. Wall Cat. 8102 and 9047.

Penang ; Wallich, Curtis, Nos. 656, 2251. Selangor : Ridley, No. 1869. Perak : King's collector, Wray ; common.

8. Canarium rufum, A. W. Benn. in Hook. fil. Fl. Br. Ind. Vol. 1, 533. A tree 60 to 100 feet high : young branches, inflorescence, petiolules and under surfaces of the leaves rusty-tomentose. *Leaves* 12 to 15 in. long, the rachises glabrous when adult. *Leaflets* 7 to 11, very coriaceous, opposite, elliptic or broadly oblong, shortly and abruptly acuminate, the edges serrate-dentate to the broad rounded sometimes slightly oblique base ; upper surface glabrous except the tomentose midrib, shining, the lower boldly and minutely reticulate : main nerves 12 to 15 pairs, spreading, very prominent beneath ; length 3 to 6 in., breadth 2 to 2·75 in., the lowest leaflets the smallest ; petiolules ·3 to ·4 in., that of the terminal leaflet 1·25 to 1·5 in. ; stipules not seen. Male

branches terminal, shorter than the leaves, very stout, the lateral branches very short, the flowers in dense bracteate clusters at their apices: bracts numerous, broadly ovate, blunt, concave, tomentose outside. *Calyx* very coriaceous, narrowly campanulate with 3 short blunt teeth, sericeous-tomentose on both surfaces. *Petals* longer than the calyx, oblong, concave, tomentose outside except the glabrous edges, glabrous inside. *Stamens* 6: the anthers linear, slightly longer than the filaments which are much dilated in the lower half and slightly united at the base into a short tube inserted outside the fleshy disc; rudimentary ovary short, broad, glabrous. *Female panicles* shorter than the male, but the flowers at least twice as large (·5 in. long); the petals narrower, the anthers much shorter than in the males and the filaments completely united for one-third of their length into a tube; ovary depressed-globular, tomentose, narrowing into the thick tomentose style: stigma discoid. *Ripe drupe* narrowly ellipsoid, sharply 3-angled, glabrous, the apex rather blunt, 2·5 to nearly 3 in. long, and 1 to 1·3 in. in diam. Engler in De Cand. Monog. Phanerog. IV, 107.

Malacca: Griffith, No. 1143, Maingay, No. 301. Perak: King's collector, Wray, Scortechini; common.

A very distinct species recognizable at once by its very coriaceous many-nerved rusty leaflets, large flowers, and boldly trigonous fruits.

9. Canarium purpurascens, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 532. A tree 50 to 70 feet high: young branches densely rusty-puberulous. *Leaves* 8 to 14 in. long; stipules rotund-cordate, rusty-pubescent. *Leaflets* 7 to 9, coriaceous, oblong to elliptic-oblong, rarely obovate-oblong, entire, or slightly serrate towards the abruptly acuminate apex, the base slightly narrowed, upper surface glabrous shining; the lower glabrous and glaucescent, often with a few scattered hairs: main nerves 10 to 14 pairs, spreading; length 2·5 to 5·5 in., breadth 1 to 2 in.; petiolule ·2 to ·25 in., that of the terminal one 1 in. or more. *Male inflorescence*; a racemose panicle often branched, rusty tomentose, 9 to 18 in. long; the ultimate branches few flowered branched cymules. *Bracts* ovate, tomentose, larger than the flower-buds, deciduous; flowers ·25 in. long. *Calyx* tubular, tomentose, with 3 broad shallow teeth. *Petals* broadly oblong, acute, concave, tomentose outside, glabrous inside. *Stamens* 6; the filaments much shorter than the narrowly oblong puberulous anthers, dilated at the base and slightly united so as to form a short tube. Disc none. *Rudimentary ovary* turbinate, glabrous, dark-coloured. *Female flowers* ·5 in. long, in stout few-flowered racemes or panicles only 2 to 4 or 5 in. long; ovary globular-ovoid, pubescent, narrowed into a short thick style: stigma large, capitate, 3-lobed. *Drupe* elliptic-ovoid, rather blunt at each end,

sub-trigonus, glabrous, 2 in. long and 1·15 in. in diam. Engler in De. Cand. Monog. Phan. IV, 115. Canarium, Wall. Cat. 9046.

Malacca: Griffith (Kew Distrib.) No. 1142, Derry. Singapore: Wallich, Ridley. Penang: Curtis, Nos. 803, 862, 959, 2708. Perak: Scortechini, No. 175, King's collector, Nos. 6181, 7885.

10. Canarium commune, Linn. A very tall tree: young branches pale puberulous, or almost glabrous. *Leaflets* 7 to 9, sub-coriaceous, ovate-elliptic, acuminate, entire, the base sub-cuneate, both surfaces glabrous; main nerves 10 to 14 pairs, spreading, rather prominent; length 3 to 5 in., breadth 1·3 to 2 in., petiolules about ·5 in.; stipules persistent, elliptic-oblong, puberulous, veined, about 1 in. long. *Panicles* terminal, lax, spreading, minutely puberulous; the flowers clustered at the apices of the branches, their buds enclosed in rotund, very concave, minutely tomentose bracts. *Calyx* campanulate, broadly 3-lobed. *Petals* 3, ovate-rotund, concave. *Stamens* 6, the filaments shorter than the anthers, free; rudimentary pistil (in the male flower) hairy. *Ovary* (in female flower) oblong-globular, glabrous, the style short and thick; stigma 3-lobed (fide Kœnig). *Fruit* ellipsoidal, sub-trigonous, the stone bony, 1-to 3-celled, 2 in. or more long and 1 to 1·25 in. in diam. Kœnig, Ann. Bot. i. 360, t. 7, f. 2; Roxb. Fl. Ind. iii. 137; Blume Mus. Bot. i. 214; Bijd. 1161; DC. Prodr. ii. 79; W. & A. Prodr. 175; Miq. Fl. Ind. Bat. vol. i. pt. 2, 643; Wall. Cat. 8493. Benn. in Hook. fil. Fl. Br. Ind. I, 531. *Sapindus travancorensis*, Wall. Cat. 8047.

Planted in Penang, Singapore and some of the other provinces, but apparently never wild.

Kœnig in his description, which is a very full one, states that the stipules are "crenate, toothed or sometimes fringed." In all the specimens accepted as *C. commune* which I have seen the stipules are entire, and Rumphius thus figures them. For this has well as for other reasons, I suspect that more than one species is included under the name *C. commune*. L.

11. Canarium coccineo-bracteatum, Kurz in Journ. As. Soc. Bengal for 1872, pt. 2, p. 296. A tree: young branches stout, minutely pale-pubescent. *Leaves* 10 to 18 in. long: stipules rather large, puberulous, pectinately lobed. *Leaflets* 5 to 9, opposite, subcoriaceous, broadly ovate, oblong-ovate to oblong, shortly acuminate, setaceous-serrulate or entire on the same tree; the base oblique, rounded, or sub-cuneate: both surfaces glabrous; main nerves 10 to 12 pairs, slightly prominent beneath; length 3·5 to 7·5, breadth 2 to 3 in.; petiolules ·2 to ·4 in., the terminal one 1·5 in. *Panicles* axillary, shorter than the leaves, deciduously puberulous, their branches rather long and spreading; the flowers crowded towards their apices, rather numerous; bracts longer than the

buds, ovate or oblong-acuminate, tomentose outside, scarlet. *Flowers* ·3 in. long, on pedicels about as long as themselves, sub-globose. *Calyx* campanulate, with three deep broad teeth, tomentose outside, glabrous inside. *Petals* longer then the calyx, valvate, ovate, obtuse, puberulous outside, glaberulous inside. *Stamens* 6; the anthers oblong, about as long as the free flattened glabrous filaments which rise from the edge of the fleshy corrugated disc: rudy. ovary minute. *Female flowers and drupe unknown.* Kurz For. Flora Burmah I, 209; A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 536. Engler in De Cand. Monogr. Phanerog. IV, 149.

South Andaman: Kurz, King's collectors.

12. Canarium Manii, King, n. sp. A tree: young branches slender, pale brown, scurfy-puberulous. *Leaves* 9 to 12 in. long, stipules (if any) deciduous. *Leaflets* 5 to 7, thinly coriaceous, ovate or ovate-rotund, shortly acuminate, entire; the base very broad, rounded or sub-cordate, never narrowed; both surfaces quite glabrous, shining, the reticulations minute: main nerves about 10 pairs, spreading, rather straight, slightly prominent beneath; length 3·25 to 4·5 in., breadth 1·5 to 2·75 in.; petiolules ·2 to ·4 in., the terminal one longer. *Panicles* terminal, slender, shorter than the leaves, minutely pubescent; their branches short (1 in. long), corymbose. *Flowers* ·25 in. long, few; buds globular, each with an oblong, obtuse tomentose bract longer than itself. *Calyx* tomentose, widely campanulate, with 3 broad, shallow teeth. *Petals* slightly longer than the calyx, broadly ovate, sub-acute, minutely pubescent externally, glabrous internally. *Stamens* 6, anthers oblong, shorter than the free glabrous slightly flattened filaments which are inserted outside the glabrous fleshy lobed disc.; ovary none. *Female flowers* unknown. *Ripe drupes* ovoid-ellipsoid, glabrous, not trigonous, 1 to 1·25 in. long and ·6 in. in diam.; the woody persistent calyx flat and 3-angled.

South Andaman Island: Man, King's collectors.

This resembles *C. euphyllum*, Kurz in its fruit, but has very different leaves and panicles: the bracts of the inflorescence in this are moreover brown, not scarlet.

13. Canarium kadondon, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 535. A tree, young branches glabrous. *Leaves* 6 to 12 (rarely 15) in. long; their rachises terete, nearly glabrous, stipules (if any) deciduous. *Leaflets* 7 to 9, elliptic-oblong to elliptic, obtusely acuminate, entire, both surfaces glabrous or nearly so, the base often unequal rounded or sub-cuneate; main nerves 6 to 9 pairs, spreading, incurved, slightly prominent beneath; length 2·5 to 5 in., breadth 1 to 2·25 in; petiolules ·35 to ·5 in., the terminal twice as long. *Panicles* sparsely rusty-

tomentose; the lateral branches short and corymbose, minutely bracteolate. *Flowers* globose in bud, about as long as the pedicels; bracteoles minute, subulate. *Calyx* fleshy, cup-shaped, shortly pilose outside, the mouth with three shallow broad teeth. *Petals* valvate, rotund, densely ferruginous, pilose outside, pubescent inside. *Stamens* 6; the anthers broadly ovate, about as long as the filaments which are dilated at the base, free, and inserted outside the broad fleshy lobed glabrous disc. *Ovary* ovoid, glabrous, stigma (in the bud) sub-sessile. *Ripe drupe* ellipsoid-ovoid, apiculate, not trigonous, glabrous, 1·15 in. long and ·6 in. in diam. Engler in DeCand. Monogr. Phanerog. IV., 138.

Malacca: Maingay (Kew Distrib.) No. 365. Perak: King's collector, many numbers. Penang: Curtis Nos. 495, 1432, 1433, 1434; Hullett, No. 186. Pahang: Ridley No. 2575.

A species distinguishable by its globular buds; its petals densely rufous-pilose externally; and by the long slender petiolules of the leaflets.

14. Canarium rubiginosum, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 534. A tree: young branches and inflorescence minutely tawny-tomentose. *Leaves* 9 to 12 in. long, the rachises glabrous when adult; stipules (if any) deciduous. *Leaflets* 5 to 7, coriaceous, elliptic-oblong, shortly and obtusely acuminate, entire, the base rounded or slightly narrowed; both surfaces glabrous when adult, the lower puberulous along the stout midrib and 10 to 13 pairs of spreading curving main nerves, the reticulations also distinct: length 3·5 to 4·5 in., breadth 1·25 to 2 in.; petiolules ·6 in., the terminal one 1·5 in. *Panicles* of male flowers terminal and axillary, 4 to 10 in. long, the branchlets bearing the flowers at their extremities in condensed many-flowered dichotomous cymes. *Buds* globular, ·1 in long, longer than the stout pedicels. *Calyx* a shallow entire cup. *Petals* deltoid, valvate, concave, much exceeding the calyx, minutely tawny-tomentose outside, glabrescent inside as is the calyx. *Stamens* 6, shorter than the petals, inserted on the outside of the lobed cushion-like fleshy disc; the anthers oblong, about as long as the flat free filaments. *Female flowers* unknown. *Ripe drupe* ellipsoid, nearly 1 in. long, and ·6 in. in diam., obscurely trigonous, glabrous. Engler in DeCandolle Monogr. Phanerog. IV, 136.

Malacca: Maingay (Kew Distrib) No. 309.

15. Canarium Kunstleri, King, n. sp. A tree 60 to 70 feet high: young branches rather stout, pale brown, minutely and deciduously scurfy-tomentose. *Leaves* 14 to 20 inches; stipules deeply laciniate, puberulous, persistent. *Leaflets* 7 to 11, sub-coriaceous, oblong to elliptic-oblong, shortly acuminate, the edges crenulate or sub-entire; the base rounded or sub-cuneate, slightly oblique; upper surface glabrous, the lower glaucous (at least when young), puberulous on the

midrib and nerves, minutely scaly; main nerves 12 to 15 pairs, spreading, curving, rather prominent beneath; length 4 to 8 in., breadth 2·25 to 3· 25 in.; petiolules ·3 to ·4 in., the terminal one twice as long. *Male panicles* terminal, rusty-puberulous, 10 to 12 in. long, spreading, compound, the flowers crowded on the ultimate branchlets; the pedicels short, tomentose, each with 1 or 2 oblong tomentose brown bracteoles which are longer than the globular buds. *Flowers* ·3 in. long. *Calyx* shorter than the petals, cut nearly to the base into 3 ovate obtuse spreading lobes, tomentose outside, puberulous inside. *Petals* ovate, tapering to each end (sub-rhomboid), the outer surface keeled, tomentose with glabrous edges, the inner glabrous. *Stamens* 6; anthers oblong, shorter than the slightly flattened free filaments which are inserted outside the glabrous corrugated disc; ruddy; ovary minute or 0. *Female panicles* as large as the male, fewer-flowered and the flowers larger, the bracts at the bases of the branches laciniate; *stamens* rudimentary; ovary ovoid, style short, thick, both glabrous, stigma large and faintly 3-lobed. *Ripe drupes* ellipsoid, rather blunt at each end, glabrous, very slightly trigonous, 1 in. long and ·6 in. in diam., the style persistent; the pedicel stout, ·6 to ·8 in. long, bearing several persistent bracteoles.

Perak: King's collector Nos. 7041, 7393 and 7509; Curtis, No. 2710.

The nearest ally of this is *C. denticulatum*, Blume, but that has much shorter filaments and smaller leaves; its fruit is unknown.

16. Canarium glaucum, Blume Mus. Bot. Lugd. Bat. I, 219. A tree 40 to 60 feet high: young branches rather slender, lenticellate, deciduously rusty-puberulous. *Leaves* 12 to 15 in. long, the rachis at first rusty-puberulous, ultimately glabrous. *Leaflets* 7 to 9, oblong or elliptic, acute or shortly acuminate, the edges obscurely and minutely crenate or serrate or sub-entire; upper surface glabrous, the midrib pubescent; the lower glaucous, rusty-pubescent on the midrib and sometimes on the 10 to 14 pairs of rather prominent spreading main nerves. *Stipules* rotund-reniform, ·4 in. long. *Panicles* terminal, the male as long as, or longer than the leaves, with lax spreading branches which become shorter upwards. *Male flowers* ·2 in. long., in small bracteate clusters at the ends of the branchlets; bracteoles broadly ovate, tomentose outside, deciduous. *Calyx* campanulate with 3 broad shallow blunt teeth. *Petals* longer than the calyx, broadly ovate-oblong, concave, tomentose outside and glabrescent within like the calyx. *Stamens* 6, the filaments shorter than the anthers, free, dilated at the base, attached outside the glabrous disc; rudimentary ovary glabrous. *Panicles of female flowers* shorter than the males, but the flowers two or three times as large. *Ovary* globose and glabrous below, grooved and pubescent upwards and tapering into the style.

Stigma large, capitate, 3-grooved. *Ripe drupe* ellipsoidal, tapering to the top, glabrous and shining, 1·75 to 2·25 in. long and 1 to 1·25 in. in diam., the persistent thickened calyx forming an open sub-entire cup at its base.

Penang: Curtis Nos. 803, 862, 2708. Perak: King's collector, No 7885.

17. Canarium secundum, Benn. in Hook. fil. Fl. Br. Ind. I, 532. A tree 30 to 50 feet high; young branches slender, and like the rachises under surfaces of the leaves and inflorescence rusty-tomentose or pubescent. *Leaves* 12 to 18 inches long; leaflets 7 to 9, thinly coriaceous, oblong, shortly caudate-acuminate, minutely serrate-dentate to sub-entire, the base rounded or slightly cuneate, upper surface glabrous except the minutely tomentose midrib; the lower much reticulate; main nerves 10 to 15 pairs, obscure above, bold beneath, curved, spreading; length 3 to 6 in., breadth 1·6 to 2 in.; petiolules of lateral leaflets only ·2 to ·3 in., those of the terminal one twice as long. *Stipules* reniform, densely tomentose outside, ·35 in. long, and about ·5 in. broad. *Panicles* terminal, rather slender, 10 to 18 in. long, and with lateral branches several inches long at the extremities of which the flowers are crowded in little heads; bracts numerous, more or less ovate or oblong, rusty-tomentose, enveloping the buds. *Flowers* sub-sessile. *Calyx* with 3 broad lobes. *Petals* oblong, sub-acute, concave, rusty-tomentose outside, glabrous within. *Stamens* 6, the narrowly oblong anthers longer than the dilated filaments which are inserted outside the disc. *Disc* adherent to the ovoid glabrous rudimentary ovary. *Female flowers* unknown. *Drupe* elongated-ovoid, sub-trigonous, sub-acute, glabrous, about 2 in. long and 1 in. in diam., the pedicel stout and the persistent calyx 3-angled. Engler in DeCand. Monogr. Phanerog. IV., 116. *Canarium*, Wall. Cat. 9046. ? *C. Bennettii*, Engler in DeCand. l. c. 119.

Singapore: Wallich, Hullett, Ridley No. 1812, King's collector No. 345. Malacca: Griffith No. 1141 and 1145, Maingay, No. 300 (Kew Distrib.). Perak: King's collector, Nos. 4330, 6101, 7610 and 10722; Scortechini, No. 2081.

This is allied to *C. rufum*, A. W. Benn., but its leaflets are thinner and the panicles much longer and more slender, with longer branches; and the drupe is much less distinctly trigonous. Dr. Engler has founded his species *C. Bennettii* on Griffith's specimen No. 1141. But on dissection of the flowers of the single specimen of that number in the Calcutta Herbarium, I cannot find that they differ from those of the same collector's No. 1145 which Engler refers to. *C. secundum*, Bennet and I therefore venture to reduce his species to this. The

filaments are slightly conjoined at the base and appear as if joined into a tube, but they are easily separable.

16. Canarium nitidum, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 532. A tree 30 to 50 feet high; young branches at first puberulous, but speedily glabrous. *Leaves* 7 to 12 in. long, glabrous, the rachis slender and the petiolules rather long. *Leaflets* 7 to 9, coriaceous, shining, oblong, shortly acuminate, quite entire, the base rounded or slightly narrowed; main nerves 7 to 9 pairs, spreading, almost horizontal, very faint; length 3·5 to 6·5 in., breadth 1·2 to 1·8 in.; petiolules ·4 to ·6 in., that of the terminal leaflet 1 to 1·5 in.; stipules deciduous (not seen). *Fruit* in short terminal racemes: the drupes when ripe ovoid, tapering to each end, glabrous, 1·25 to 1·75 in. long, and about 1 in. in diam. Engler in De Cand. Monog. Phaner. IV, 108; Wall Cat. 8546 *in part.*

Singapore: Wallich. Malacca: Griffith 1147; Maingay No. 358, (Kew Distrib). Perak: King's collector, Nos. 4604, 4263, 5658 and 10916.

Male flowers of this are not known. The ripe drupe is much more ovoid than in the majority of the species, and this is the character by which, so far as the material goes (for male flowers of this are unknown) it is most readily distinguished from *C. parvifolium*, Benn. A flowering specimen recently collected in Singapore by Mr. H. M. Ridley (No. 3799) may belong to this. Ripe fruit from the same tree is required to settle the matter.

2. Trigonochlamys, Hook. f.

A tree with pustulate tomentose-pubescent branches. *Leaves* alternate, imparipinnate, with opposite petiolulate leaflets. *Flowers* polygamous. *Calyx* large, keeled, with 3 large connivent valvate segments. *Petals* 3, valvate, about equalling the calyx. *Disc* annular. *Stamens* 6, inserted on the margin of the disc; filaments very short. *Ovary* 3-celled, nearly globose; style straight, short, stigma 3-lobed; ovules 2 in each cell, axile. *Drupe* obliquely globose, 1-celled, 1-seeded.—A single Malayan species.

1. Trigonochlamys Griffithii, Hook. fil. in Trans. Linn. Soc. XXIII, 170, t. XXVII. A tree 50 to 100 feet high: young branches rather slender, sparsely lenticellate, rusty-puberulous. *Leaves* 6 to 12 in. long, their rachises minutely tomentose; leaflets 13 to 15, thinly coriaceous, oblong-lanceolate, acuminate, entire, the base rounded or slightly narrowed: upper surface glabrous except the tomentose midrib, pale when dry; the lower sparsely pubescent, pale brown when dry and the 13 to 15 pairs of sub-horizontal main nerves rather prominent:

length 1·5 to 3 in., breadth ·65 to ·1 in. *Panicles* shorter than the leaves, few-flowered, rusty-tomentose ; branchlets and pedicels with linear-oblong bracts. *Flowers* polygamous, ·35 in. long. *Calyx* large, keeled, with 3 deep broad triangular connivent rusty-tomentose segments. *Petals* narrowly elliptic, slightly exserted, densely pale tomentose with a glabrous spot on the base inside. *Stamens* 6, inserted by short filaments on the edge of a thin hypogynous annular glabrous disc, very small in the pistillate flowers. *Ovary* depressed sub-globular, glabrous, the style basi-lateral; the stigma depressed, capitate, obscurely 3-lobed. *Drupe* obliquely sub-globose, glabrous, about ·5 in. in diam. Bennet in Hook. fil.Fl. Br. Ind. I, 539. *Santiria Griffithii*, Engler in DC. Monog. Phanerog. IV, 155.

Malacca; Griffith, No. 1148 ; Maingay (Kew distrib.) No. 316. Perak ; King's collector Nos. 4625, 1828, 8817.

4. Santiria, Blume.

Reziniferous trees. *Leaves* alternate, 3-foliolate or imparipinnate, firm ; leaflets opposite, slightly oblique, entire. *Flowers* in uniformly hermaphrodite, axillary or terminal branched panicles ; the stipules, (if any) fugacious, bracts usually obsolete, bracteoles minute. *Calyx* cupuliform, 3-lobed or 3-fid, valvate. *Petals* 3, valvate or sub-imbricate, broad and truncate at the base, exceeding the calyx. *Disc* annular, fleshy, adnate. *Stamens* 6, distinct, usually inflexed, inserted on the margin or outside of the disc. *Ovary* 3-celled, with 2 ovules in each cell; style short, stigma capitate or 3-lobed. *Drupe* ellipsoidal or sub-globose, more or less laterally compressed on the ventral side, and the scar of the stigma usually lateral or basal, 1-celled, 1-seeded ; the stone crustaceous, rarely woody, *Cotyledons* contortuplicate.—Distrib. Malayan Archipelago. Species probably 35.

Panicles longer than the leaves.

Panicles and leaves glabrous; leaflets 9 to 20 in. long	1. *S. floribunda.*
Panicles hispidulous-pubescent; leaflets sparsely hispidulous on the lower surface 4 to 8 in. long flowers on long slender pedicels	2. *S. laxa.*
Panicles puberulous; leaflets glabrous; leaflets 3 to 9 in. long flowers on short pedicels	3. *S. fasciculata.*

Panicles shorter than the leaves.
Panicles solitary, axillary or terminal, with rather long peduncles.
Branches of the panicles few, lax, slender, very long and bearing the flowers on short distant cymules ... 4. *S. puberula.*
Branches of the panicle numerous, stout, divaricate; the flowers in corymbose cymes towards their apices.
Flowers ·2 to ·25 in. long; ripe fruit more than 1 in. long ... 5. *S. macrocarpa.*
Flowers ·1 in. long or less: ripe fruit ·6 to ·7 in. long.
Flower-buds conical ... 6. *S. lævigata.*
Flower-buds globular ... 7. *S. oblongifolia.*
Panicles sessile, branching from the base, sometimes more than one from a leaf-axil.
Leaflets quite glabrous.
Scar of stigma terminal in the ripe fruit; leaflets narrowly oblong, their main nerves 12 to 14 pairs ... ... 8. *S. longifolia.*
Scar of stigma of ripe fruit approximated to its base.
Leaflets oblong to elliptic-oblong; nerves 10 to 15 pairs ... ... 9. *S. Wrayi.*
Leaflets elliptic-oblong to ovate; nerves about 8 pairs or fewer ... ... 10. *S. apiculata.*
Leaflets more or less hairy beneath.
Leaflets quite glabrous on the upper surface.
Lower surface of leaflets boldly reticulate and rusty-pubescent ... ... 11. *S. costata.*
Lower surface not conspicuously reticulate, rusty-puberulous when young; main nerves about 10 pairs 12. *S. conferta.*

Leaflets glabrescent on the upper surface, the midrib tomentose; lower surface densely rusty-tomentose; main nerves 15 to 20 pairs ... ... 13. *S. multiflora.*

1. Santiria floribunda, King n. sp. A tree 20 to 30 feet high: young branches stout, scurfy, rusty-pubescent. *Leaves* 2 or 3 feet long, the rachises flattened and channelled on the upper surface below the lowest leaflets, auricled at the very base, puberulous at first but speedily glabrous. *Leaflets* 13 to 15 or 17, coriaceous, oblong, shortly acuminate; the base rounded, slightly unequal; glabrous on both surfaces, the midrib alone sometimes puberulous on the lower, reticulations minute; main nerves 20 to 30 pairs, spreading, curving at the tips, interarching but slightly; length 9 to 20 in., breadth 2·35 to 5 in.; petiolules very stout, 5 to 7 in. long. *Panicles* 2 to 3 feet long, slender, much branched, striate, glabrous, bearing numerous scattered horizontal short branchlets ·5 to 1·5 in. long which bear two or three 3- to 5-flowered cymules. *Flowers* 1 in. long; their pedicels longer, unequal, slender, puberulous, with a few subulate bracteoles at the base. *Calyx* flat, 3-angled, glabrescent. *Petals* erect, deltoid, fleshy, concave, keeled along the middle, glabrous outside. *Stamens* 6, the filaments shorter than the oblong anthers, slightly dilated below, inserted on the outer surface of the edge of the thick fleshy cupular disc. *Ovary* small. *Style* short, stout, 3-angled like the stigma. *Ripe drupes* elliptic, apiculate, glabrous, ·8 in. long and ·5 in. in diam; the peduncles slender, ·5 to ·75 in. long; stigmatic scar terminal.

Perak: King's collector, Nos. 7510, 7632 and 10151.

There are in the Calcutta Herbarium flowering specimens of a species closely allied to this; but in the absence of fruit I hesitate to describe it.

2. Santiria laxa, King. A tree 50 to 70 feet high: young branches, rachises of the leaves, and the inflorescence densely clothed with rusty, hispidulous, spreading and mostly deciduous hairs. *Leaves* 14 to 22 in. long, the stipules (if any) deciduous. *Leaflets* 7 to 9, oblong to oblong-elliptic, sometimes slightly obovate, shortly and abruptly acuminate, the edges entire, the base often unequal-sided, cuneate: length 5 to 8 in., breadth 1·75 to 2·5 in., petiolule ·4 or ·5 in.; both surfaces reticulate, the upper glabrous, the lower sparsely hispidulous especially on the midrib and nerves: main nerves 12 to 14 pairs, slightly prominent on the lower surface, spreading, curving, interarching near the edge. *Panicles* usually much longer than the leaves, terminal, their branches short, lax, rather few-flowered, the ultimate branchlets gla-

brous, the larger hispidulous-pubescent. *Flowers* ·3 in. in diam., glabrous, shorter than the slender minutely bracteolate pedicels. *Calyx* with 3 broad, spreading, very blunt teeth, much shorter than the corolla. *Petals* 3, thick, slightly keeled on the back, ovate, obtuse. *Stamens* 6, free, about as long as the petals, inserted on the outer margin of the 6-lobed, glabrous, cushion-like disc; anthers ovate, about as long as the thick rather flattened filaments: rudimentary ovary submerged in the disc, small, sub-cylindric, glabrous as is the thick fluted style; stigma 3-lobed. *Female flowers* unknown. *Ripe drupes* narrowly ellipsoid, trigonous, one side wider and flatter than the other two, glabrous, 1 to 1·4 in. long and ·6 to ·7 in. in diam; stone thin. *Canarium laxum*, A. W. Benn. in Hook. fil. Fl. B2. Ind. I. 535; Engler in DeCand. Monog. Phanerog. IV, 139.

Malacca; Maingay (Kew Distrib.,) No. 366. Perak: King's collector, Nos. 3192 and 3516. Penang: Curtis No. 1431. Pahang; Ridley No. 2451.

The drupes of this have the remains of the stigma terminal, and in this respect they agree technically with the diagnosis of *Canarium*. But they are not equally 3-sided as in that genus, one side being wider and more rounded than the other two. The structure of the flower is not at all that of *Canarium*, and I therefore transfer the species to *Santiria*.

3. Santiria fasciculata, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 539. A tree 40 to 50 feet high: young branches at first rusty-pubescent, becoming glabrous, the bark pale cinereous. *Leaves* 10 to 15 in., the rachis terete, at first puberulous, afterwards glabrescent, slightly flattened on the upper surface near the base. *Leaflets* 5 to 7, membranous, elliptic to elliptic-oblong, more or less caudate-acuminate, the base cuneate, both surfaces glabrous; main nerves 7 or 8 pairs, spreading, much curved, interarching, bold and prominent on the lower, inconspicuous on the upper surface; length 4·5 to 9 in., breadth 2 to 3 in; petiolules ·75 to 1 in., much thickened at each end, the terminal one much longer. *Panicles* slender, puberulous, terminal, as long as or longer than the leaves, with few long, narrow, angular, lax branches bearing at intervals short 6- to 10-flowered cymules. *Flowers* ·05 in. long; the pedicels unequal, tomentose, bracteolate. *Calyx* cupular, hispid-tomentose outside with 3 bold, deltoid, acute teeth. *Petals* imbricate, slightly longer than the calyx, deltoid, glabrescent. *Stamens* 6, filaments about as long as the broadly ovate anthers and inserted outside the edge of the ring-like glabrous disc. *Ovary* ovoid, glabrous. *Ripe drupes* narrowly and obliquely ovoid, flattened on one side, slightly gibbous at the base, glabrous, the scar of the stigma terminal, ·8 in.

long and ·6 in. in diam. Engler in DeCand. Monogr. Phanerog. IV, 164.

Malacca: Maingay (Kew Distrib.) No. 307. Penang; Curtis No. 1544. Perak: King's collector, Nos. 3123, 3319, 3716, 3500, 6610; Scortechini No. 1988.

4. Santiria puberula, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 537. A tree 30 to 50 feet high: young branches slender, pale gray, at first puberulous afterwards glabrous. *Leaves* 8 to 10 in. long, the rachises glabrescent or glabrous, terete, flattened on the upper surface just above the base. *Leaflets* 5 rarely 7, thinly coriaceous, elliptic to oblong, acute or shortly acuminate, the base slightly cuneate; upper surface quite glabrous; the lower minutely puberulous, reticulate, the 9 to 11 pairs of spreading, curving, interarching nerves prominent: length 4 to 6 in., breadth 1·5 to 2·5 in.; petiolules ·4 to ·6 in. long, the terminal one 1 to 1·75 in., all swollen at the upper end. *Panicles* terminal or axillary, shorter than the leaves, minutely tomentose, with a few lax spreading branches bearing rather distant, 5- to 8-flowered, sub-sessile cymules. *Flowers* about ·05 in. long, the pedicels about as long, unequal, stout, tomentose. *Calyx* cupular; with 3, deltoid, acute teeth, tomentose outside. *Petals* valvate, ovate-rotund, concave, with a slight inflected point at the apex, glabrous, much longer than the calyx. *Stamens* 6; filaments longer than the ovate anthers, inserted on the edge of the crenulate fleshy disc: ovary ovoid, glabrous. *Ripe drupes* narrowly ellipsoid, straight on one side, curved on the other, obscurely 3- or 4-angled, glabrous, the scar of the stigma terminal; length ·75 in., diam. ·35 in. Engler in DC. Mon. Phan. IV, 161.

Perak: Wray, No. 3210: King's collector, No. 3438, 3529, 6832.

This comes very near to *S. fasciculata*, A. W. Benn., and I much doubt its being really distinct from that species.

5. Santiria macrocarpa, King n. sp. A glabrous tree, 40 to 70 feet high: young branches with brown lenticellate bark. *Leaves* 5 to 9 in. long, the rachis slightly flattened on the upper surface near the base. *Leaflets* thinly coriaceous, oblong-elliptic to obovate or sub-rotund, very shortly and bluntly apiculate; the base cuneate, rarely rounded; main nerves 7 or 8 pairs, spreading, slightly curved, interarching boldly, slightly depressed on the upper surface (when dry) and sub-prominent on the lower; length 3 to 4·75 in., breadth 2 to 2·75 in.; petiolules ·35 to ·5 in., the terminal one 1 in. or more. *Panicles* axillary, solitary, shorter than the leaves, with distant lateral branchlets ·5 to 1 in. long and bearing at their apices 2- to 6-flowered bracteolate cymules. *Flowers* ·2 to ·25 in. long. *Calyx* thick, deeply cupular or sub-campanulate, with 3 bold triangular lobes, glabrescent. *Petals* twice as long as the calyx, fleshy,

glabrous, broadly oblong, very concave, the apex much thickened and deeply inflexed and the sides partly inflexed to form a kind of hood. *Stamens* 6; the filaments much shorter than the oblong anthers, lanceolate, dilated at the base and inserted outside the quadrate lobes of the thin ring-like disc. *Ovary* ovoid-globose, glabrous, tapering into the short thick style: stigma discoid. *Ripe drupes* obliquely ovoid, flattened on one side, glabrous, 1·25 to 1·5 in. long, and about ·75 in. in diam; peduncle slender, ·5 to 1 in. long, scar of stigma terminal.

Perak: King's collector, Nos. 5304, 5580 and 7298.

6. Santiria laevigata, Blume Mus. Bot. I, 211. A tree 50 to 100 feet high: young branches dark-coloured, lenticellate, glabrous. *Leaves* 9 to 17 in. long, glabrous: the rachises flattened below the lowest leaflet and channelled at the base. *Leaflets* coriaceous, elliptic-oblong to oblong, shortly acuminate; the base usually rounded or sub-cordate, but sometimes narrowed and sub-oblique: both surfaces reticulate, the lower brown when dry: main nerves 11 to 17 pairs, sub-horizontal, slightly prominent on the lower surface; length 4·5 to 9 in, breadth 1·5 to 2·8 in., petiolules about ·5 in. *Panicles* shorter than the leaves, axillary or slightly supra-axillary, solitary, 6 to 8 in. long (including the rather long peduncles), spreading; the branches ascending, puberulous near the apices where the flowers are crowded in conical ebracteolate cymes. *Flowers* less than ·1 in. long, shorter than the pedicels. *Calyx* cupular, the mouth almost entire or waved, minutely tomentose outside. *Petals* deltoid-rotund, the apex inflexed, valvate, glabrous. *Stamens* 6; anthers ovate, about as long as the filaments which are inserted by dilated bases outside the ring-like disc: rudimentary ovary small, ovoid. *Female flowers* not seen. *Ripe drupes* ·6 in. long, glabrous, broadly ovoid, blunt, flattened on one side, the remains of the stigma near the apex of the flattened side, peduncle ·5 in. long. A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 538; Engler in DeCand. Monog. Phanerog. IV, 165. *Canarium laevigatum*, Miq. Fl. Ind. Bat., Vol. I, Pt. 2, p. 648. *Canarium altissimum*, Herb. Korth.

Malacca; Griffith No. 1149, Maingay. Perak; King's collector, Nos. 4438, 5441, 5839 and 7961; Scortechini.—Distrib. Sumatra.

The leaves of this vary a good deal as to the number of the main nerves and as to the shape of the base, some having broad and even sub-cordate while others have cuneate bases.

7. Santiria oblongifolia, Blume in Mus. Bot. Lugd. Bat. I, 211. A tree 50 to 80 feet high: young branches pale, lenticellate, at first scurfy, afterwards glabrous. *Leaves* 12 to 18 in. long; their rachises terete, not winged at the base but slightly flattened, glabrous, the stipules (if any) deciduous. *Leaflets* 7 to 9 in., thinly coriaceous, oblong,

occasionally ovate-oblong or ovate, slightly unequilateral especially at the base; the apex very shortly abruptly and bluntly acuminate, edges entire; base in the oblong forms sub-cuneate, in the ovate forms broad and rounded; upper surfaces glabrous and reticulate, olivaceous when dry; the lower pale brown when dry, very minutely lepidote; main nerves 10 to 13 pairs (in the ovate forms only 7 or 8 pairs), spreading, interarching near the edge; length 4 to 6 in., the ovate forms shorter; breadth 1·75 to 2·25 in.; petiolules ·5 to ·7 in., the terminal one 1·5 in. *Panicles* axillary or terminal, shorter than the leaves, pale scurfy when young, divaricate, cymose, spreading, the flowers crowded near the extremities of the branches, ebracteolate. *Buds* ·1 in. in diam., sub-globular, about as long as the clavate pedicels. *Calyx* campanulate, deeply cut into 3, rotund, deltoid, sub-concave teeth, scurfy outside. *Petals* sub-rotund with a truncate base, slightly concave, longer than the calyx, puberulous outside, glabrous inside. *Stamens* 6. *Anthers* oblong, about as long as the filaments: the latter flattened, narrow, inserted outside the glabrous, thin, fleshy, lobed disc. *Ripe drupes* ovoid, ellipsoid or globose, flattened on one side, oblique, obscurely 3-gonous, glabrous, ·7 in. long, and ·5 in. in diam., the scar of the stigma at the apex of the flattened side. Engler in DeCand. Monog. Phanerog, IV, 162. *Santiria Maingayi*, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 538: Engler l. c. IV, 165. *Canarium oblongifolium*, Miq. Fl. Ind. Bat. I, Pt. 2, p. 645. *Canarium eupteron*, Miq. Fl. Ind. Bat., Vol. I, Pt. 2, p. 648.

Malacca, (Kew Distrib.) No. 310. Perak: a common tree, King's collector.—DISTRIB. Sumatra, Java, Borneo.

Blume's original description (drawn up from specimens from Java and Sumatra) suits this plant well. An authentic specimen of Miquel's *Canarium eupteron* shows that that species must be reduced here, as must Bennet's *Santiria Maingayi* of which Maingay's specimen No. 310 (Kew Distrib.) is the type. *Canarium sub-repandum*, Miq. is, according to its author, closely allied to *C. eupteron*, Miq. and should probably also be reduced to this.

8. SANTIRIA LONGIFOLIA, King n. sp. A tree 10 to 20 feet high: young branches very stout, (·5 to ·75 in. in diam.), their bark brown, glabrous, lenticellate. *Leaves* 2 to 3 feet long, glabrous; the rachises stout, flattened below the lowest leaflets, not winged at the bases. *Leaflets* 11 to 15 pairs, narrowly oblong, gradually tapering to the acuminate apex, the base oblique or rounded; main nerves 12 to 14 pairs, spreading, curved, not prominent: length 9 to 11 in., breadth 1·75 to 2·5 in.; petiolules ·65 to 1 in., stout, enlarged at each end. *Flowers* unknown. *Fruiting panicles* much shorter than the leaves, one or two in the axil of a leaf, unequal, only 4 to 7 in. long, glabrous, the branches short.

Ripe drupes ovoid, flattened on one side, the scar of the stigma terminal, glabrous, 1 in. long. and ·65 in. in diam.

Perak: King's collector, Nos. 3594, 6838.

This is so unlike any described species of *Santiria* that, in spite of the absence of flowers on the only specimens I have seen, I have ventured to name it. The small size of the tree and the large size of its leaves make it easy of recognition in the genus.

9. Santiria Wrayi, King n. sp. A tree 20 to 30 feet high: young branches very thick, (·75 to 1 in. in diam.) *Leaves* 12 to 30 in. long; the rachises trigonous, channelled in the lower part and almost winged at the base, puberulous. *Leaflets* 13 to 15, membranous, oblong to elliptic-oblong, very shortly and bluntly acuminate; the base rounded, slightly oblique; upper surface shining, olivaceous when dry, the lower pale brown, both glabrous and reticulate; main nerves 10 to 15 pairs, spreading, curving, slightly prominent beneath, length 6 to 11 in., breadth 2·5 to 4 in.; petiolules thickened at both ends, ·5 to 1 in., the terminal one more than twice as long. *Panicles* 3 or 4 in. long, several densely crowded in the axils of one leaf, ebracteolate, puberulous or glabrescent below, the ultimate branches scurfy rufous-puberulous. *Flowers* ·1 or ·15 in. long, shorter than the pedicels. *Calyx* cupular, the mouth with 3, broad, shallow teeth, glabrous, with a few hairs near the edge. *Petals* valvate, rotund, glabrous, rather fleshy. *Stamens* 6; the anthers ovate, longer than the flattened filaments which are inserted on the outside of the edge of the ring-like, fleshly, glabrous, corrugated disc. *Rudimentary ovary* small, ovoid. *Female flowers* unknown. *Ripe drupes* obliquely ovoid, slightly compressed, blunt at each end, ·6 to ·75 in. long, glabrous, the scar of the stigma approximated to the peduncle, peduncle ·5 in. long.

Perak: Wray, Nos. 1423, 2970; King's collector, No. 3689; Scortechini No. 2095.

Allied to *S. conferta*, but with larger leaves and fruit, much less hairy panicles, and perfectly glabrous leaves.

10. Santiria apiculata, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 537. A tree 20 to 50 feet high: young branches with pale bark, puberulous. *Leaves* 6 to 8 in. long, stipules (if any) deciduous. *Leaflets* membranous, oblong, elliptic-oblong to ovate, more or less bluntly acuminate, the base rounded or cuneate, glabrous on both surfaces and reticulate especially on the lower; main nerves rather irregular, about 8 pairs, ascending, curved, slightly prominent beneath, length 3·5 to 5·5 in., breadth 1·75 to 2·25 in.; petiolules ·4 to ·6 in., the terminal longer. *Panicles* axillary, slender, shorter than the leaves, more or less pyramidal, glabrous, the flowers small and crowded near the puberulous

apices, bracteoles minute. *Flowers* ·1 in. or less in diam., their pedicels twice as long. *Calyx* cupular with 3 broad, shallow, blunt teeth, nearly glabrous. *Petals* rotund, glabrous. *Stamens* 6, inflexed; anthers ovate, about as long as the flattened filaments which are inserted by their slightly dilated bases outside the glabrous fleshy lobed and corrugated disc. *Rudimentary ovary* ovoid, sunk in the disc, pubescent; style very short; stigma 3-lobed, small, terminal. *Female flowers* in panicles like the males, the stamens with broader filaments: ovary broadly ovoid, pubescent, style very short: stigma large, discoid, cupulate, terminal, *Ripe drupes* ovoid-globose, ·5 in. long, glabrous, the scar of the stigma near the base, the pericarp thinly coriaceous. Engler in DeCand. Monogr. Phanerog. IV, 163.

Malacca: Maingay, Nos. 303, 308, 314 (Kew Distrib.) Perak: Scortechini 1701: King's collector;—Distrib.; Sumatra.

The fruit is remarkable for the close approximation of the remains of the stigma to the peduncle. The venation of the leaves is variable: in many specimens the main nerves bifurcate about half way between the midrib and the edge of the leaf, while in others there is no bifurcation at all.

11. Santiria costata, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 537. A tree: young branches with gray bark, rusty-puberulous at first, ultimately glabrous. *Leaves* 6 to 9 in. long: stipules (if any) deciduous; the rachises broadly channelled above in the lower part, but not winged at the base. *Leaflets* coriaceous, oblong-lanceolate to elliptic, shortly and bluntly acuminate, the base acute or rounded: upper surface quite glabrous and shining, the midrib prominent on both surfaces; lower surface boldly reticulate and with a few scattered hairs; the 9 to 11 pairs of main nerves spreading, curving, very prominent, rusty-pubescent; length 3·5 to 4·5 in., breadth 1·25 to 2 in.,; petiolules ·35 to ·5 in., thickened at both ends. *Panicles* solitary, much shorter than the leaves, (only about 3 in. long) few-branched, rusty-tomentose, deciduously bracteolate. *Flowers* ·1 in. long, in small fascicles at the ends of the branchlets; the slender pedicels about as long or longer. *Calyx* cupular, truncate, dentate, glabrescent. *Petals* much longer than the calyx, broadly ovate, blunt, concave, nearly glabrous. *Stamens* 6; the filaments about as long as the anthers, slender and inserted beneath the margin of the outside of the small ring-like disc. *Ripe drupes* narrowly ovoid, slightly flattened on one side, ·75 in. long and ·5 in. in diam., the scar of the stigma apical. Engler in DeCandolle Monogr. Phanerog. IV, 157.

Malacca: Maingay (Kew Distrib.) No. 313. Perak: King's collector, No. 7597.

The short rusty-tomentose panicles, and almost glabrous flowers on slender pedicels distinguish this from *S. fasciculata*, to which it is closely allied. The leaves also give diagnostic marks, those of this species having more nerves and being pubescent beneath.

12. Santiria conferta, A. W. Benn. in Hook. fil. Fl Br. Ind. I, 537. A tree: young shoots rather stout (·35 in. in diam.), rusty-puberulous, afterwards glabrous and striate. *Leaves* 12 to 18 in. long; stipules (if any) deciduous, the rachis rufous-puberulous when young. *Leaflets* coriaceous, 9 to 13, oblong to oblong-lanceolate, gradually tapering to the acuminate apex, the base rounded: upper surface glabrous, shining, minutely reticulate, olivaceous when dry; the lower brown when dry, minutely rusty-puberulous when young; main nerves about 10 pairs, spreading, curving, slightly prominent on the lower surface: length 3·5 to 6 in., breadth 1·6 to 2 in., petiolules ·6 to ·7 in. *Panicles* 3 to 4 in. long, several from an axil and much shorter than the leaves, rufous-pubescent, densely crowded, bracteoles minute; pedicels slightly shorter than the flowers. Flowers ·1 to ·15 in. long. *Calyx* cupular, with 3 shallow broad teeth, rusty-tomentose outside. *Petals* imbricate, rotund, concave, puberulous. *Stamens* 6, inflexed, the anthers ovate, about as long as the flat filaments which are inserted on the edge of the fleshy ring-like disc; *rudimentary ovary* small, glabrous, ovoid. *Female flowers* not seen. *Ripe drupes* obliquely ovoid, dark-coloured, glabrous, rather less than ·5 in. long, the scar of the stigma near the base, pericarp stoutly coriaceous. Engler in De Candolle Monogr. Phanerog. IV, 160.

Malacca: Maingay (Kew Distrib.) No. 306, Griffith No. 1150.

This is readily distinguished by its crowded condensed rufous-tomentose panicles and small glabrous fruit.

13. Santiria multiflora, A. W. Benn. in Hook. fil. Fl. Br. Ind. I, 538. A tree, 60 to 100 feet high: young branches rather stout (·35 to ·5 in. in diam.), densely and minutely rusty-tomentose like the rachises and under surfaces of the leaves and the inflorescence. *Leaves* 9 to 15 in. long; the rachises terete in the upper part, but channelled near the base. *Leaflets* 5 to 7, coriaceous, oblong or elliptic-oblong, tapering slightly to the shortly acuminate apex; the base cuneate or obliquely rounded; upper surface glabrescent except the tomentose midrib and 15 to 20 pairs of sub-horizontal main nerves which are bold and prominent on the lower surface; length 4·5 to 10 in., breadth 2 to 3 in., petiolules ·4 to ·5 in. *Panicles* axillary or terminal, solitary, shorter than the leaves, ebracteolate, (? bracteoles caducous) spreading. *Flowers* crowded at the extremities, ·1 in. long, slightly longer than their tomentose pedicels. *Calyx* a shallow cup, the mouth almost entire or with 3 shallow wavy teeth, tomentose outside. *Petals* much longer than the

calyx, slightly imbricate, thick, broadly ovate, obtuse, with short slightly inflexed apical appendix, glabrous. *Stamens* 6, the ovate anthers about as long as the thick flattish filaments which are inserted on the edge of the thick fleshy ring-like disc; *rudimentary ovary* ovoid, minute. *Female flowers* not seen. *Ripe drupes* ovoid-globose, flattened on one side, ·75 in. long, glabrous, the scar of the stigma below the apex of the flattened side. Engler in DeCand. Monogr. Phanerog. IV, 160.

Malacca: Griffith, No. 1151; Maingay (Kew Distrib.) No. 305. Perak: King's collector.

I quite agree with the author of this species that, when better material of *Santiria tomentosa*, Blume (Mus. Lugd. Bat. I, 211), shall be forthcoming, the two will probably be found to be identical.

INDEX.

Names of New Genera and Species have an asterisk (*) prefixed.

Abies, 155
Abrus, 85
„ *precatorius*, 48, 55, 70
Acacia concinna, 48, 49, 50, 70
ACANTHACEÆ, 74
Acanthocyathus, 138
„ *grayi*, 138
ACANTHOPTERGII, 177
Acis, 171
Acronychia, 205, 214, 215
„ *laurifolia*, 214
„ *pedunculata*, 215
„ *Porteri*, 214, 215
Acrostichum appendiculatum, 48
„ „ (var. *setosa*, 82
„ *aureum*, 82, 84
„ *costatum* var. *deltigera*, 82
„ *scandens*, 82, 84
Actephila, 86
„ *excelsa*, 48, 75
„ *javensis*, 75
ACTINIARIA, 151, 169
Adansonia, 68
Adiantum lunulatum, 56, 81.
Ægle, 205
Aganosma marginata, 54, 73
Alcyonacea, 171
ALGÆ, 50, 53, 55, 83, 84
Allophylus Cobbe, 48, 69
Alsodeia bengalensis, 48, 65
Amoora cucullata, 158
„ *decandra*, 48, 69
„ *Rohituka*, 50, 69.
Amorphophallus, 48, 49, 80, 85
„ *bulbifer*, 80
„ *campanulatus*, 80
„ *oncophyllus*, 80
„ *rex*, 80
„ *tuberculiger*, 80
„ *virosus*, 80
* „ *(Candarum) rex*, 79
AMPELIDEÆ, 69
Amyris punctata, 221
„ *simplicifolia*, 226
„ *sumatrana*, 221
ANACANTHINI, 180
ANACARDIACEÆ, 70
Anamirta Cocculus, 50, 65
ANCISTROCLADEÆ, 89
Ancistrocladus, 87, 89, 157,
„ *extensus*, 137
„ „ var. *pinangianus* 137
„ *guineensis*, 137
„ *pinangianus*, 137
„ *sagittatus*, 234
Ancistrolobus, 137
ANDESITE, 166
Anisoptera, 88, 96, 100
„ *Curtisii*, 100
„ „ var. *latifolia*, 100
„ *odorata*, 101
Anodendron paniculatum, 50, 73
Anthogorgia, 171
ANTHOZOA ACTINIOMORPHA, 169
„ ALCYONIOMORPHA, 171
Antiaris, rufa, 76
„ *toxicaria*, 48, 76
Antitaxis calocarpa, 50, 65
APOCYNEÆ, 73
Apodytes andamanica, 50, 69
ARCHASTERIDÆ, 171
Ardisia humilis, 47, 55, 72
Aristolochia Tagala, 50, 74
ARISTOLOCHIACEÆ, 74
AROIDEÆ, 79
ARTHROPODA, 176
Artocarpus Lacoocha, 48, 76
Arum campanulatum, 80
Arytera macrocarpa, 236
ASCLEPIADACEÆ, 73
Aspidopterys, 192. 193, 195
„ *concava*, 195
„ *Helferiana*, 195
Asplenium falcatum var. *urophyllum*, 82
„ *nidus*, 50, 82
„ *urophyllum*, 48
ASTEROIDEA, 171
ASTROPECTINIDÆ, 172
ASTROPHYTIDÆ, 173
Astroschema, 169, 173
* „ *flosculus*, 173
Atalantia, 206, 224
„ *floribunda*, 225
„ *longispina*, 224
„ *macrophylla*, 225
„ *monophylla*, 225
„ *platistigma*, 225

Atalantia Roxburghiana, 225
AURANTIACEA, 219
Avicennia officinalis, 160
Balanocarpus, 89, 130, 132, 133, 134, 135.
,, *anomalus*, 130, 132
,, *Curtisii*, 130, 131, 132
* ,, *Heimii*, 131, 133
* ,, *Hemsleyanus*, 131, 134
* ,, *maximus*, 131, 133
* , *penangianus*, 130, 131
* ,, *Wrayi* 131, 134
Balanophyllia, 144
* ,, *scabra*, 144, 149
Balsamina angustifolia, 204
BALSAMINEÆ, 198
Banistiria bengalensis, 195
,, *tetraptera*, 195
,, *unicapsularis*, 195
Barringtonia racemosa, 158
,, *speciosa*, 47, 53, 71
Bathyactis, 148, 149
* ,, *stephanus*, 149
,, *symmetrica*, 149
* *Bathypercis*, 177
* ,, *platyrhynchus*, 178
Bathypterois, 178
Bergera integerrima, 219
BIGNONIACEÆ, 74
BIOLITE, 166
Biophytum, 198, 199
,, *adiantoides*, 199, 200
,, *sensitivum*, 199
Blachia andamanica, 48, 75
Blumea glomerata, 47, 72
,, *laciniata*, 72
,, *myriocephala*, 50, 72
Bœhmeria malabarica, 50, 76
Boerhaavia, 47
,, *repens*, 48, 56, 74
Bombax, 48, 65, 68
,, *anceps*, 66, 67
,, *asiaticæ*, 65
,, *cambodiense*, 67
,, *festivum*, 67
,, *insigne*, 66, 67, 68
,, ,, var. *alba*, 66, 67
,, ,, ,, *anceps*, 66
,, *insigne* var. *andamanica*, 67
,, ,, ,, *cambodiensis*, 67
,, ,, ,, *genuina*, 67
,, ,, ,, *larutensis*, 68
* ,, ,, ,, *polystemon*, 65, 67
,, ,, ,, *typica*, 67
,, ,, ,, *Wightii*, 67
,, *malabaricum*, 66, 68
,, ,, var. *albiflora*, 66
,, *pentandrum*, 66, 68
Brachylophon, 192, 193, 196
,, *Curtisii*, 196, 197
,, *Hullettii*, 196
* *Scortechinii*, 196, 197
Bregmaceros, 181
,, *MacClellandii*, 181
Brewstera crenata, 191
Breynia, 49
,, *Rhamnoides*, 48, 75
Bridelia tomentosa, 48, 75
Brissopsis, 174
* ,, *Oldhami*, 174
Brucea, 226, 228,
,, *dulia*, 228
,, *sumatrana*, 228
Bryum coronatum, 50, 56, 83
BURSERACEÆ, 68, 235
Cactus, 157
Cæsalpinia Bonducella, 48, 70
Calliaster, 172
* ,, *mamillifer*, 172
Callicarpa arborea, 50, 54, 55, 74
Callionymus, 178
Calophyllum inophyllum, 49, 65
Calothrix, 53
Calothrix pulvinata, 83
,, *tasmanica*, 55, 83
Canarium, 184, 185, 236, 237, 238, 246, 250, 255
,, *altissimum*, 257
,, *bengalense*, 184, 185, 186, 187 188, 242
,, *Bennettii*, 250
* ,, *caudatum*, 238, 240
,, *coccineo-bracteatum*, 239, 246
,, *commune*, 239, 246
,, *denticulatum*, 249
,, *dichotomum*, 243
,, *Euphyllum*, 68, 188, 238, 241, 247
,, *eupteron*, 258
,, *glaucum*, 239, 249
,, *grandiflorum*, 238, 242
,, *hirtellum*, 239, 243, 244
,, *Kadondon*, 239, 247
* ,, *Kunstleri*, 239, 248
,, *lævigatum*, 257
,, *laxum*, 255
* ,, *Manii*, 239, 247
,, *nitidum*, 240, 241, 251
,, *oblongifolium*, 258
,, *parvifolium*, 238, 240, 241, 251
,, *pilosum*, 239, 243
,, *Planchoni*, 238, 240
,, *purpurascens*, 239, 245
,, *reziniferum*, 188
,, *rubiginosum*, 239, 248
,, *rufum*, 239, 243, 244, 250
,, *secundum*, 239, 250
* ,, *sikkimense*, 187, 188
,, *strictum*, 184, 185, 186, 187, 188
,, *sub-repandum*, 258
Canavalia turgida, 48, 70
* *Candarum rex*, 79

Cansjera Rheedei 48, 69
CAPPARIDEÆ, 65
Capparis sepiaria, 48, 49, 50, 56, 85
,, ,, var. *grandifolia*, 65
,, *tenera*, 49
,, ,, var. *latifolia*, 65
Carapa moluccensis, 69, 158
Carica Papaya, 78
Caryota, 86
,, *mitis*, 50, 77
,, *sobolifera*, 77
CASSIDULIDÆ, 173
CERIANTHINEÆ, 151, 153, 169
Cerianthus, 153, 169, 170
,, *americanus*, 153
* ,, *andamanensis*, 153
* ,, *tenebrarum*, 169
Ceriops Candolleana, 158
Chalcas paniculata, 220
,, *sumatrana*, 220
CHALCEDONY, 165
CHAMPAK, 153, 154
* CHARNOCKITE, 164
Cheilanthes tenuifolia, 54, 82
Chionotria monogyna, 217
,, *rigida*, 217
Chorisia, 68
Citrus, 205
,, *angulata*, 224
Clausena, 206, 220
,, *excavata*, 220
,, *simplicifolia*, 215
Cleisostoma, 157
Clerodendron inerme, 49, 74
,, *sericeum*, 194
Cocos, 56
,, *nucifera*, 77
CŒLENTERATA, 169
Cœnopsammia, 146
,, *urvillii*, 146
Collema nigrescens, 83
Colquhounia, 30, 31, 32, 35
,, *coccinea*, 30, 31, 32, 33, 34, 35, 36, 37, 38
,, ,, var. *major*, 31, 32 33, 36
,, ,, ,, *mollis*, 34, 37
,, ,, ,, *parviflora*, 31, 32, 33, 36
,, ,, ,, *typica*, 35
,, ,, ,, *vestita*, 36
,, *elegans*, 30, 31, 32, 33, 34, 35, 37, 38
,, ,, var. *pauciflora*, 38
,, ,, ,, *tenuiflora*, 38
,, ,, ,, *typica*, 37
,, *martabanica*, 33, 38
,, *mollis*, 32, 33, 34, 35, 37, 38
,, *parviflora*, 37, 38
,, *pauciflora*, 38
,, *tenuiflora*, 33, 34, 38
Colquhounia, tomentosa, 33, 37
,, *vestita*, 30, 31, 32, 33, 34, 36, 37
,, ,, var. *rugosa*, 33, 34, 37,
Colubrina asiatica, 48, 49, 66, 69
COMBRETACEÆ, 70
COMMELINACEÆ 77
COMPOSITÆ, 72, 84, 85
Congromuræna, 183
,, *longicauda*, 183
,, *megastoma*, 183
* ,, *nasica*, 183
* ,, *squaliceps*, 183
CONIFERÆ, 153, 155
Connaropsis, 198, 200, 202
,, *dioica*, 201
,, *Griffithii*, 200
* ,, *macrophylla*, 200, 201, 202
,, *monophylla*, 200, 202
Conus, 143
Convolvulaceæ, 73, 84
Convolvulus parviflorus, 47, 73
Cookia graveolens, 221
CRUSTACEA, 176
CUCURBITACEÆ, 71
Cyathohelia, 169, 171
,, *axillaris*, 171
Cyclea peltata, 55, 65
Cycloseris, 147, 148
,, *cyclolites*, 147
,, *discus*, 147
* ,, *mycoides*, 147, 149
,, *sinensis*, 147
Cyclostemon assamicus, 75
,, *macrophyllus*, 75
Cyminosma Ankenda, 215
,, *pedunculata*, 215
CYPERACEÆ, 81
Cyperus pennatus, 47, 81
Dalbergia monosperma, 48, 70
,, *tamarindifolia*, 54, 70
Dapania, 198, 201, 202
,, *racemosa*, 202
,, *scandens*, 201, 202
Davallia solida, 81
,, *speluncæ*, 50, 81
Debis, 6
DECAPODA, 176
Dedaelea griercina, 83
Dendrobium, 55, 76
,, *Pierardi*, 157
Dendrophyllia, 146, 171
,, *gracilis*, 146
,, *nigrescens*, 171
Derris scandens, 70
Desmodium polycarpon, 47, 55, 70
Diaseris, 147, 148
,, *distorta*, 147
* ,, *fragilis*, 148, 149
,, *freycineti*, 147, 148
Dilleniacea nervosa, 122

DIORITE 166
Dioscorea, 55, 56, 85
,, *glabra*, 77
,, *sativa*, 49, 77
DIOSCOREACEÆ, 77
Diospyros Kurzii, 48, 73
* *Dipsacaster*, 172
* ,, *pentagonalis*, 172
,, *sladeni*, 172
DIPTEROCARPEÆ, 87, 121, 137
Dipterocarpus, 88, 89, 94, 98, 99
,, *alatus*, 90. 98, 99
,, *angustifolius*, 99
,, *Blancoi*, 95
,, *cornutus*, 90, 93
,, *costatus*, 98, 99
,, *crinitus*, 89, 90, 91
,, *Dyeri*, 96
,, *fagineus*, 90, 94, 99
,, *gracilis*, 99
,, *grandiflorus*, 90, 95, 96, 97
,, *Griffithii*, 90, 96, 99
,, *Hasseltii*, 93
,, *hirtus*, 91
,, *incanus*, 90, 97, 98
,, *indicus*, 92, 93
,, *intricatus*, 99
* ,, *Kerrii*, 89, 93
* ,, *Kunstleri*, 90, 96
,, *laevis*, 92, 93
,, *lamellatus*, 99
,, *Lemeslei*, 99
,, *Lowii*, 99
,, *Motleyanus*, 96
,, *oblongifolius*, 90, 95
,, *pilosus*, 99
,, *prismaticus*, 94
,, *pterygocalyx*, 96
,, *retusus*, 96
* ,, *Scortechinii*, 89, 91
* ,, *Skinneri*, 89, 91
,, *stenopterus*, 95
,, *Tamparan*, 91
,, *trinervis*, 96
,, *tuberculatus*, 93
,, *turbinatus*, 89, 92
,, ,, var. *andamanica*, 92
Dischidia nummularia, 50, 73
Discotrochus, 142
* ,, *investigatoris*, 142, 149
Dodonæa, 86
,, *viscosa*, 54, 69
Doona, 126
Dracæna angustifolia, 47, 77
Dryobalanoidea, 123, 125
Dysomma bucephalus, 184
EBENACEÆ, 73
ECHINODERMA, 169, 171
Echinogorgia, 171.
ECHINOIDEA, 173
Echinolampas, 169, 173
* ,, *castanea*, 173
,, *spheroidalis*, 174
Entada scandens, 49, 70
Epizoanthus, 152
,, *stellaris*, 152
Eranthemum succifolium, 47, 74
Eriodendron, 68
,, *anfractuosum*, 66
Erioglossum edule, 48, 69
Erites, 1, 2, 6
,, *angularis*, 2, 3, 4, 5, 6
,, *argentina*, 2, 3
,, *elegans*, 2, 3, 4
,, *falcipennis*, 2, 6
,, *medura*, 2, 3, 5, 6
,, ,, var. *ochreana*, 3
,, *ochreana*, 1, 3
* ,, *rotundata*, 2, 4, 5, 6, 7
,, *undularis*, 9
Erythrina indica, 47, 70
Erythroxylon, 189, 190
,, *burmanicum*, 190
,, *retusum*, 190
,, *sumatranum*, 190
EU-DIPTEROCARPEÆ, 87
Eugenia Jambolana, 55, 71
Eu-Hopea, 123, 126
EUPHORBIACEÆ, 75, 84, 86
Eupsammia, 144
* ,, *regalis*, 144, 149
EUPSAMMIDÆ, 144, 171
EURITE, 165, 166, 167
Eurycoma, 227, 229
,, *apiculata*, 229, 230
,, *longifolia*, 229, 230
,, *merguensis*, 230
,, *tavoyana*, 230
Eu-santiria, 237, 238
Eu-shorea, 108.
EUTAXITE, 165
EUTHEMIDEÆ, 231
Euthemis, 231, 234
,, *elegantissima*, 235
,, *leucocarpa*, 234, 235
,, *minor*, 234, 235
Eu-Vateria, 127
Eu-Vatica, 101, 102
Evodia, 205, 206
,, *euneuron*, 209
,, *glabra*, 207, 208, 209
,, *latifolia*, 206, 207, 209
* ,, *macrocarpa*, 207, 209
,, *Marambong*, 208
* ,, *pachyphylla*, 207, 210
,, *pedunculosa*, 207, 211
* ,, *pilulifera*, 207, 210
,, *robusta*, 207, 209
,, *Roxburghiana*, 207, 208, 209
,, *triphylla*, 208
Excæcaria agallocha, 158

Fagara Lunur-ankenda, 208
,, *triphylla*, 208
Ficus, 48, 50
,, *Benjamina*, 76
,, *brevicuspis*, 49, 76, 83
,, *callosa*, 49, 76
,, *comosa*, 48
,, *cuneata*, 190
,, *cuspidifera*, 56
,, *gibbosa* var. *cuspidifera*, 75
,, *glaberrima*, 50, 75
,, *hispida*, 48
,, ,, var. *dæmonum*, 76
,, ,, ,, *typica*, 76
,, *nervosa*, 76
,, *nitida*, 48, 56
,, *retusa* var. *nitida*, 76
,, *Rumphii*, 48, 56, 76
,, *variegata*, 76
FILICES, 81
Fimbristylis, 55
,, *diphylla*, 58, 81
,, *ferruginea*, 47, 54, 81
Flabellum, 138
,, *aculeatum*, 138
,, *japonicum*, 170
,, *laciniatum*, 170
,, *oweni*, 138
,, *spinosum*, 138
,, *stokesi*, 138
,, *variabile*, 138
Flueggia, 73
,, *microcarpa*, 53, 54, 75
FUNGIDÆ, 147
FUNGUS, 50, 56, 83
GADIDÆ, 180
Gærtnera racemosa, 194
Gallesioa graveolens, 221
GARNET, 162, 163, 164
Garuga pinnata, 49, 55, 68
Gela lanceolata, 215
Gelonium bifarium, 48, 54, 56, 75
GERANIACEÆ, 197
Globigerina, 177
Glochidion calocarpum, 48, 56, 75
Gloriosa superba, 56, 77
Glycosmis, 205, 216
,, *arborea*, 216
,, *chylocarpa*, 216
,, *cyanocarpa* var. *sapindoides*, 218
,, *macrophylla*, 217
,, *nitida*, 217
,, *pentaphylla*, 48, 68, 216, 218
,, ,, var. *longifolia*, 217
,, ,, ,, *macrophylla*, 917
,, ,, ,, *macrorachis*, 217
,, *puberula*. 216, 218
,, *Retzii*, 216
Glycosmis, sapindoides, 216, 217
,, *triphylla*, 217
Gomphia, 231, 232
,, *angustifolia*, 233
,, *Hookeri*, 232, 233
,, ,, var. *corymbosa*, 233.
,, *pulcherrima*, 233
,, *sumatrana*, 232, 235
,, *sumatrensis*, 233
Gonocitrus angulatus, 224
GOODENOVIEÆ, 72
Gordonia decandra, 192
,, *peduncularis*, 191
Gorgonacea, 171
Gorgonella, 171
Gouania leptostachya, 50, 69
GRAMINEÆ, 81
GRANITE, 136
GRANILITE, 166
Grewia, 49
,, *lævigata*, 49, 68
Guettarda, 48
,, *speciosa*, 47, 72
GUTTIFERÆ, 65
Gyrocarpus Jacquinii, 49, 71
Harrisonia, 226, 227
,, *Brownii*, 227
Heritiera fomes, 158
,, *littoralis*, 50, 53, 68
Heterocyathus, 141, 146, 148
,, *æquicostatus*, 141, 142
,, *phillippensis*, 141, 142
* ,, *wood-masoni*, 141, 149
Heteropsammia, 141, 145, 146, 148
* ,, *aphrodes*, 145, 149
,, *geminata*, 145
,, *ovalis*, 145
,, *rotundata*, 145
Hibiscus tiliaceus, 47, 48, 49, 56, 65
Hipparchia medura, 3
Hiptage, 192, 193
,, *javanica*, 194
,, *madabrota*, 194
,, *parviflora*, 194
,, *sericca*, 193, 194
,, ,, var. *longe-racemosa*, 194
Hiræa concava, 195
,, *indica*, 196
,, *merguensis*, 195
Hirneola polytricha, 83
HOMOLIDÆ, 177
Hopea, 88, 115, 123, 124, 125, 126
,, *cernua*, 125
* ,, *Curtisii*, 123, 124
,, *Dryobalanoides*, 125, 126, 127
,, *faginea*, 105
,, *grandiflora*, 101
,, *gratissima*, 115
* ,, *intermedia*, 123, 125, 126
,, *maranti*, 121
,, *Mengarawan*, 125, 126

Hopea, micrantha, 123, 124, 125, 126, 127
* „ *nervosa*, 123, 124
„ *Singkawang*, 123
Hoya, 85
„ *diversifolia*, 73
„ *orbiculata*, 47, 73
parasitica, 73
Hyalonema, 152
Hydrocera, 198, 204
„ *angustifolia*, 204
„ *triflora*, 204
Hypericinea dentata, 191
„ *macrocarpa*, 192
HYPERSTHENE, 162, 163, 164
Hypsophrys, 177
superciliosa, 177
Icicopsis, 237
Impatiens, 198, 202
„ *chinensis*, 203, 204
„ *Griffithii*, 203
„ *mirabilis*, 203
natans, 204
„ *triflora*, 204
Ipomæa biloba, 47, 48, 53, 73
„ *denticulata*, 48, 73
„ *grandiflora*, 47, 73
„ *Turpethum*, 49, 73
„ *vitifolia*, 48, 73
Irvingia, 227, 230
„ *malayana*, 230
Isauxis, 102, 127, 135, 136
Ischæmum, 85
„ *muticum*, 54, 31, 85
Isoptera, 88, 129
„ *borneensis*, 129
Ixonanthes, 189, 191
„ *cuneata*, 191
„ *dodecandra*, 191
icosandra, 191, 192
„ *obovata*, 191
„ *reticulata*, 191, 192
Ixora brunnescens, 47, 49, 56, 72
„ *cuneifolia*, 55, 72
Jambolifera pedunculata, 215
Juncella, 171
LABIATAE, 30, 31, 34, 35
Leea sambucina, 48, 69
LEGUMINOSÆ, 70, 84
Lenzites platyphyllus, 83
Lethe, 6
„ *europa*, 6
LICHENES, 83
LILIACEÆ, 77
Limonia angulata, 224
„ *arborea*, 216
„ *diacantha*, 221
„ *leptostachya*, 214
„ *monophylla*, 225
„ *pentaphylla*, 216
„ *scandens*, 222
„ *trifoliata*, 221
LINEÆ, 189
Lophius, 179
* „ *mutilus*, 179
Lophohelia, 143
Lovenia, 175
* „ *gregalis*, 175
Luvunga, 206, 221
„ *eleutheranthera*, 222
„ *scandens*, 222
„ *tavoyana*, 222
LYCOPODINEÆ, 81, 84
Lycopodium cernum, 54, 81
Macaranga, 86
„ *Tanarius*, 50, 55, 75
Macharisia icosandra, 191
Madrepora axillaris, 171
Madreporaria aporosa, 170, 171
MAGNETITE, 162, 163
Magnolia, 154
MAGNOLIACEÆ, 153
Mallotus, 86
„ *andamanicus*, 48, 75
MALPIGHIACEÆ, 192
MALVACEÆ, 65
MELASTOMACEÆ 71
MELIACEÆ, 69
Melicope, 205, 212
„ *Helferi*, 212
„ *tetrandra*, 212
Memecylon edule, 48, 71
Meniscium deltigerum, 82
MENISPERMACEÆ, 65
MICROLINE, 162, 164
Micromelum, 206, 218
„ *hirsutum*, 218, 219
„ *pubescens*, 218, 219
Mitreola, 85
„ *oldenlandioides*, 53, 73
Mocanera grandiflora, 96
Molina racemosa, 194
MOLLUSCA, 176
Morinda, 48
„ *bracteata*, 47, 50, 56
„ *citrifolia* var. *bracteata*, 72
Mucuna gigantea, 48, 70
MURÆNIDÆ, 183
Murex palmarosæ, 176
Murraya, 206, 219
„ *brevifolia*, 220
„ *Burmanni*, 221
„ *exotica*, 220
„ *Glenieii*, 220
, *paniculata*, 220
, *sumatrana*, 220
Musa, 85, 86
„ *sapientum*, 77
MUSCI, 82
Mussænda macrophylla, 54, 71
Myristica glauca, 50, 74
MYRISTICACEÆ, 74
Shorea, stellata, 109, 120

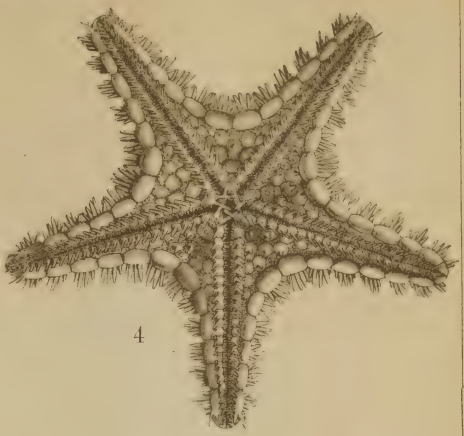
Myrsineæ, 72
Myrtaceæ, 71
Myxospermum chylocarpum, 217
Nacula, 176
Neckera, 84
,, *rugulosa*, 50, 82
Nematophora, 169
Neobythites, 181
* ,, *steatiticus*, 181
Nephrodium terminans, 50, 82
Nephrolepis tuberosa, 54, 55, 82
Nipa fruticans, 158
Nyctagineae, 74
Nymphæa, 154
Ochna, 231
,, *andamanica*, 232
,, *crocea*, 233
,, *nitida*, 232
,, *obtusata*, 232
,, *squarrosa*, 232
,, *stipulacea*, 232
,, *Wallichii*, 231, 232
Ochnaceæ, 231
Ochneæ, 231
Oculinidæ, 143, 171
Odina Wodier, 49, 70
Odontostomus, 169, 182
* ,, *atratus*, 182
Olacineæ, 69
Oldenlandia, 85
,, *corymbosa*, 54, 71
Oleoxylon balsamiferum, 98
Oligoclase, 162
Onychium auratum, 55, 82
Ophidiidæ, 181
Ophiuroidea, 173
Oplismenus, 85
,, *Burmanni*, 55, 81
Orchidaceæ, 76, 153, 155
Oroxylum indicum, 48, 55, 74
Orthoclase, 162
Oxalideæ, 198
Oxalis, 198, 199
,, *corniculata*, 198
,, *pusilla*, 199
,, *repens*, 199
Pachira, 68
Pachychlamys, 109
Pachynocarpus, 89, 102, 135, 136
,, *Stapfianus*, 135, 136
,, *Wallichii*, 135
Pæderia fœtida, 49, 72
Palmeæ, 77
Pandanaceæ, 79
Pandanus, 45, 48, 53, 54, 56, 77
,, *odoratissimus*, 47, 48, 79
Paracyathus, 139
* ,, *cavatus*, 139, 149
,, *crassus*, 139
* ,, *fulvus*, 139, 149
,, *indicus* var. *gracilis*, 139
**Paracyathus, porphyreus*, 140 149
,, *pulchellus*, 140
Paramignya, 206, 223
,, *angulata*, 224
,, *armata*, 223
,, ,, var. *andamanica*, 223
,, *longispina*, 223, 224
,, *monophylla*, 224
Parashorea, 120
,, *stellata*, 120
Parinarium, 94
,, *dillenifolium*, 94
Parthenope, 177
,, *spinosissima*, 177
Parthenopidæ, 177
Pedicularis, 7
* ,, *diffusa*, 7, 9
* ,, *flaccida*, 8, 9
,, *flexuosa*, 8
,, *gracilis* var. *macrocarpa*, 8
,, *likiangensis*, 9
,, *lineata*, 9
,, *refracta*, 8, 9
,, *spicata*, 9
,, *szetschuanica*, 9
,, *verticillata*, 8, 9
Pediculati, 179
Peniophora papyrina, 83
Pentacme, 88, 107
* ,, *malayana*, 107
Pentagonasteridæ, 172
Petalandra, 126
,, *micrantha*, 126
Petrocarpa dillenifolia, 94
Phajus alba, 157
Phaseolus adenanthus, 48, 70
Phœnix paludosa, 158
Pholidota imbricata, 54, 77
Phos, 176
Phyllanthus reticulatus, 54, 75
Physalis, 85
,, *minima*, 55, 74
Physiculus, 180
* ,, *argyropastus*, 180
,, *roseus*, 180
Physostomi, 182
Picea, 155
Picrasma, 226, 227
,, *andamanica*, 228
,, *javanica*, 227, 228
,, *nepalensis*, 228
Pierotia lucida, 191
Pierrea, 134
,, *penangiana*, 133 134
Pimela dichotoma, 243
,, *stricta*, 186
Pipturus velutinus, 50, 76
Pisces, 177
Pisonia aculleata, 48, 74
,, *alba*, 49, 74
,, *excelsa*, 49, 74

Plagioclase, 162, 165
Platynema laurifoliun, 193
Pleurotoma, 176
,, *atractoides*, 176
Pluchea indica, 47, 56, 72
Plumieria, 154
Pogonatherum, 85
,, *saccharoideum*, 55, 81
Pollia, 85
,, *Aclisia*, 50, 77
Polycyathus, 143
* ,, *andamanensis*, 143 149
Polypodium adnascens, 50, 82
,, *irioides*, 50, 82
,, *quercifolium*, 82
Polyporus australis, 83
,, *xanthopus*, 88
Pongamia glabra, 53, 70
Pothos scandens, 50, 81
Premna, 48, 49
,, *integrifolia*, 48, 50, 56, 74
Pseudarchaster, 171
,, *mosaicus*, 171
Psilotum triquetrum, 54, 81
Pteris biaurita, 55, 82
,, *longifolia*, 55, 82
Pyroxenite, 163
Quadrella, 177
,, *coronata*, 177
Quartz, 162, 164, 165, 166, 167
Raninidæ, 177
Raninoides, 177
,, *personatus*, 177
Retinodendron, 88, 102, 127, 135
,, *bancanum*, 129
* ,, *Kunstleri*, 127, 128, 129
,, *pallidium*, 128
,, *pauciflorum*, 127
,, *Rassak*, 127, 128
* ,, *Scortechinii*, 128
Rhamneæ, 69
Rhizotrochus, 170
* ,, *crateriformis*, 170
Rhodopsammia, 146
,, *carinata*, 146, 147
,, *socialis*, 147
Rhyolite, 166
Rhytisma, 83
Richetia, 132
,, *penangiana*, 132
Rostellaria delicatula, 176
Roucheria, 189
,, *Griffithiana*, 190
Rubiaceæ, 71, 84
Rutaceæ, 68, 205
Ryssopteris elliptica, 197
Saccolabium, 157
Salmalia malabarica, 67
Santiria, 236, 237, 238, 252, 255, 259
,, *apiculata*, 253, 259
,, *conferta*, 253, 259, 261
Santiria, costata, 253, 260
,, *fasciculata*, 252, 255, 256, 261
* ,, *floribunda*, 252, 254
,, *Griffithii*, 252
,, *lævigata*, 253, 257
,, *laxa*, 252, 254
* ,, *longifolia*, 253, 258
* ,, *macrocarpa*, 253, 256
,, *Maingayi*, 258
,, *multiflora*, 254, 261
,, *oblongifolia*, 253, 257
,, *Planchoni*, 237, 238, 240
,, *puberula*, 253, 256
,, *tomentosa*, 262
* ,, *Wrayi*, 253, 259
Sapindaceæ, 69
Sapindus travancorensis, 246
Sapotaceæ, 72
Satyridæ, 2, 3
Satyrinæ, 6
Satyrus (Erites) medura, 3
Scævola Kœnigii, 47, 56, 72
Scirpearella, 171
Scitamineæ, 77, 157
Sclerostylis macrophylla, 217
,, *pentaphylla*, 216
,, *Roxburghii*, 226
Scopelidæ, 182
Scrophularineæ, 74
Selas lanceolatum, 215
Semecarpus heterophylla, 50, 55, 70
Shorea, 87, 88, 107, 115, 122, 123, 135
,, *acuminata*, 108, 113
,, *astrosticta*, 110
,, *auriculata*, 114
,, *brachyptera*, 123
,, *bracteolata*, 109, 117
* ,, *ciliata*, 109, 118, 120
* ,, *costata*, 109, 119
,, *Curtisii*, 108, 111
,, *disticha*, 113
,, *eximia*, 109, 121, 135
,, *foveolata*, 117
* ,, *glauca*, 109, 117
,, *gratissima*, 108, 115
,, *Hemsleyana*, 135
* ,, *Kunstleri*, 109, 116
,, *lacunosa*, 112
,, *leprosula*, 108, 110, 135
,, *macroptera*, 108, 113
,, *maranti*, 109, 120
,, *Martiniana*, 123
* ,, *Maxwelliana*, 108, 109, 114, 116,
,, *parviflora*, 125
,, *parvifolia*, 108, 112, 126
* ,, *pauciflora*, 109, 116,
,, *pinangiana*, 105
* ,, *Ridleyana*, 109, 115
,, *scaberrima*, 123
* ,, *scutulata*, 108, 110
,, *sericea*, 108, 111

Shorea, stenoptera, 123
,, *sub-lacunosa*, 121
,, *Talura*, 101
* ,, *Thiseltoni*, 110, 122
* ,, *utilis*, 109, 119
Sideroxylon ferrugineum, 72
Sigaretus, 176
SIMARUBEÆ, 226
SOLANACEÆ, 74
Solenocera Hextii, 176
Sonneratia acida, 158
,, *apetala*, 158
SPATANGIDÆ, 174
SPATANGOIDA, 173
SPHENOPIDÆ, 151, 152
Sphenopus, 152
,, *arenaceus*, 152
,, ,, var. *barnettii*, 152
,, *marsupialis*, 152
,, *pedunculatus*, 152
Spongodes, 171
SPURGE, 157
STACHYDEÆ, 35
Stemoporus Wightii, 127
Sterculia rubiginosa, 47, 56
,, ,, var. *glabrescens*, 68
STERCULIACEÆ, 68
Strychnos acuminata, 50, 73
Synaptea, 100, 101, 102, 135
,, *Dyeri*, 106
,, *faginea*, 105
,, *grandiflora*, 101
,, *odorata*, 101
Tellina, 176
,, *Murrayi*, 176
Terminalia Catappa, 47, 49, 55, 56, 70
Tetractomia, 205, 211
,, *majus*, 211
,, *Roxburghii*, 211, 212
Tetramerista, 231, 233
,, *glabra*, 233
,, *paniculata*, 212
Thelephora incrustans, 83
Thespesia populnea, 47, 49, 65
Thysanolæna, 85
,, *acarifera*, 47, 181
TILIACEÆ, 68
Toddalia mitis, 214
TRACHINIDÆ, 177
TRACHININA, 177
TRAPEZIIDÆ, 177
Trema amboinensis, 50, 54, 55, 75
Trichilia spinosa, 225
Trichomanes, 47, 84
,, *pyxidiferum* 50, 81
Trichosanthes palmata, 50, 71
Trigonochlamys, 236, 237, 238, 251
,, *Griffithii*, 251
Triomma, 235, 236
,, *malaccensis*, 236
,, 206, 221
Triphasia, aurantiola, 221
,, *sarmentosa*, 222, 223
,, *trifoliata*, 221
Tristellateia, 192, 193
,, *australasica*, 193
TURBINOLIDÆ, 138, 170
Turræa virens, 225
Tylophora, 49
,, *globifera*, 49, 73
Tytonia natans, 204
URTICACEÆ, 75 84
Vanda, 157
Vandellia, 85
,, *crustacea*, 54, 55, 74
Vateria, 127
,, *Ceylonica*, 127
,, *indica*, 127
,, *lanceæfolia*, 127, 128
,, *Roxburghiana*, 101, 127
Vatica, 88, 100, 101, 102, 104, 106, 122 127, 135
,, *bancana*, 129
,, *bantamensis*, 103
,, *chinensis*, 101
* *Vatica cinerea*, 102, 104
,, *Curtisii*, 102, 105
,, *Dyeri*, 102, 106
,, *eximia*, 121
,, *faginea*, 102, 105
,, *grandiflora*, 101
,, *laccifera*, 101
,, *lanceæfolia*, 128
* ,, *Lowii*, 102, 103
,, *Maingayi*, 102, 103, 104
* ,, *nitens*, 104
,, *nitida*, 102
,, *pallida*, 128
* ,, *perakensis*, 102, 103
* ,, *reticulata*, 103, 106
,, *Roxburghiana*, 101
,, *ruminata*, 136
,, *scaphula*, 127
,, *sub-lacunosa*, 121
,, *verrucosa*, 136
,, *Wallichii*, 136
VERBENACEÆ, 74
Vernonia divergens, 47, 72
VERTICILLATÆ, 9
Vigna lutea, 48, 70
VIOLARIEÆ, 65
Vitis carnosa, 69
,, *lanceolaria*, 48, 69
,, *repens*, 55, 69
Wedelia scandens, 47, 56, 72
Xanthoxylon nilagiricum, 208
,, *Roxburghianum*, 208
,, *triphyllum*, 208
,, *zeylanicum*, 208
Ximenia lanceolata, 215
Zanthoxylum, 205, 213, 214
,, *glandulosum*, 214

Zanthoxylum, longifolium, 214
,, *lucidum*, 214
,, *myriacanthum*, 213, 214
,, *ovalifolium*, 213
,, *Rumphianum*, 207
,, *undulatum*, 214
ZOANTHEÆ, 151
ZOANTHIDÆ, 151, 152
Zoanthus, 152
,, *confertus*, 152
,, *solanderi*, 152
Zoroaster alfredi, 173
,, *barathri*, 173
ZOROASTERIDÆ, 173

3



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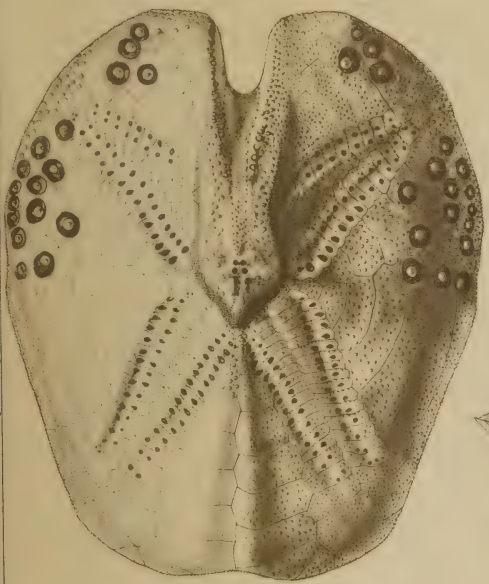

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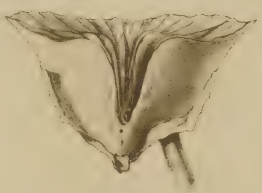

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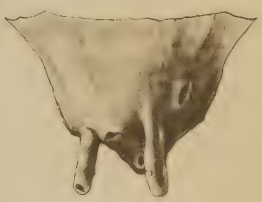

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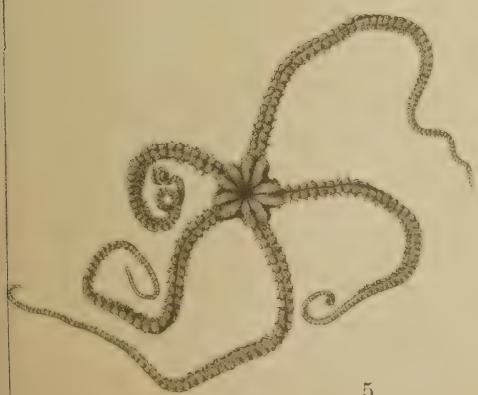

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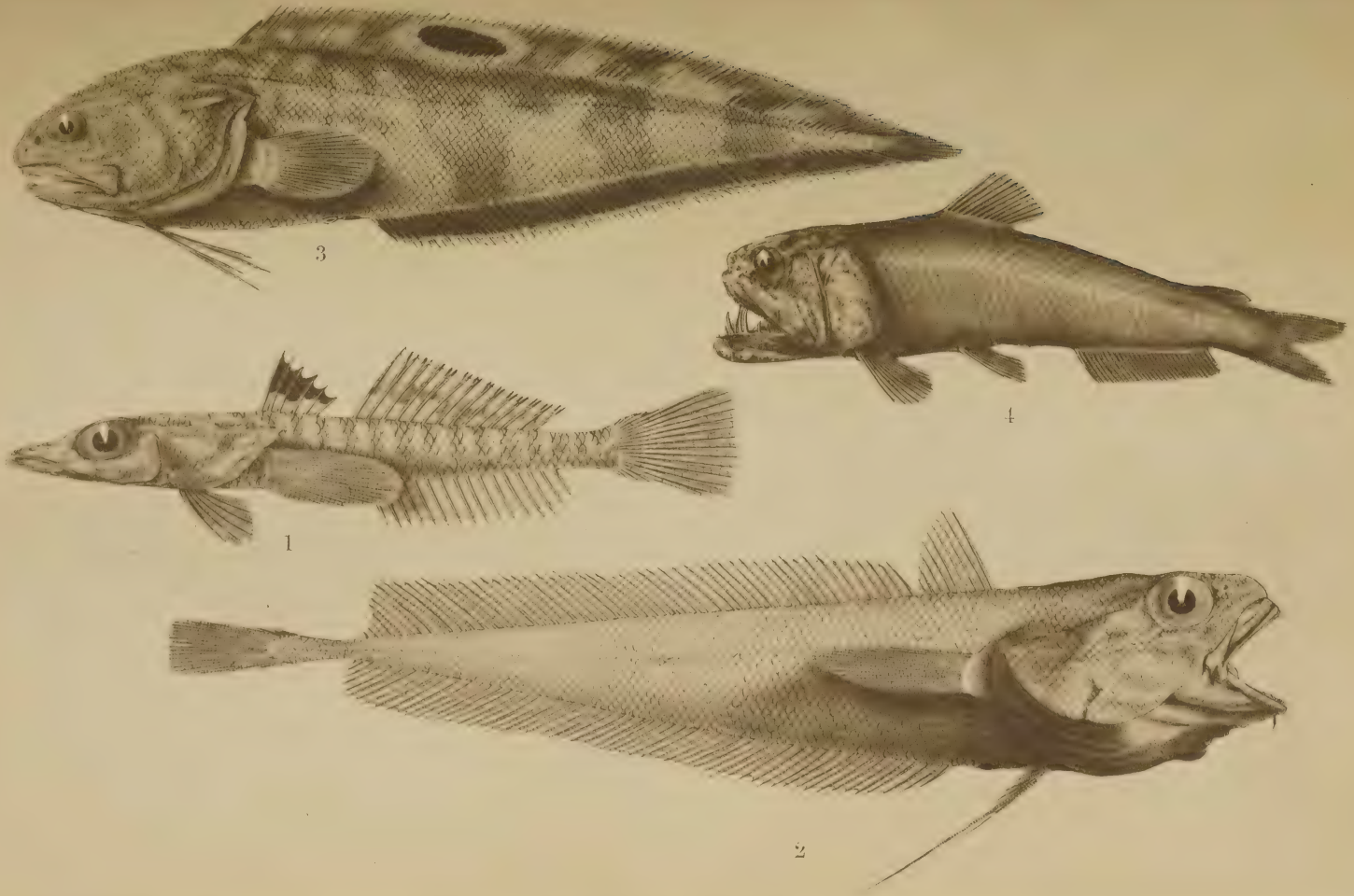

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14
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1
6
10
11
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JOURNAL

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Vol. I, Part III.—ANTHROPOLOGY AND COGNATE SUBJECTS.

No. I.—1893.

PROLEGOMENA ANTHROPOLOGICA.

By the Hon'ble H. H. Risley, *Indian Civil Service, Companion of the Indian Empire, Honorary Member of the French Academy, President, Anthropological Society of Bombay, Anthropological Secretary, Bengal Asiatic Society.*

CHAPTER I.

The Place of Man in Nature.

In the first attempt to classify the animal kingdom Linnaeus placed men and monkeys side by side in the order of mammals which he designated Primates. In our own time there has been much discussion of the question whether the differences between the two correspond to the distinction between an order and a sub-order. Mr. Owen thought he had proved that in man alone the lesser brain is completely surpassed in size by the larger, but this theory which would have given to man an indisputably higher structural rank than the most advanced apes, is now generally admitted to have been based upon erroneous observations.

Note. This is the first of a series of brief papers dealing in as concise a form as possible with the chief branches of the science of anthropology as now understood.

Even the standard distinction between man as an animal with two hands, and apes as creatures with four, has been swept away by recent investigations. Professor Huxley* has shown that in all important relations of number, arrangement and form, the tarsal-bones of the gorilla resemble those of man. The only difference is that in the gorilla the metatarsal bones are relatively longer and more slender, while the great toe is comparatively shorter and weaker, and along with its metatarsal bones is joined to the base of the foot by a looser and more pliable joint. But although the gorilla's hind member must be admitted to be structurally a true foot, its functions differ from those of the human foot, and this fact alone raises the morphological status of man far above that of the highest apes. Status in this sense depends upon specialisation of function. The more purposes a given member has to discharge the lower is its morphological rank. Thus a man's foot can only be used for walking; while a gorilla's foot, although a true foot in virtue of its anatomical character, is also a prehensile organ and therefore less specialised and of a lower type. Apes walk either on the outside edges of their feet or like the orang-otang and chimpansee on the upper surfaces of their toes, which are folded down when the erect position is assumed.† Differences of habit again lead to modifications of structure. The upright position leads to the shortening of the arms, which are no longer used for locomotion, though they retain their power of prehension, and causes the pelvis to assume the dish-like form adapted to support the intestines. The relatively capacious skull is evenly balanced on the vertebral column, and if, as is the case with the Negro, the jaws project greatly, the correlative development of the cerebellum serves to maintain equilibrium.

Another difference between men and apes consists in the development of the teeth. With us the canines appear before the grinders, and the front grinders precede the back; with apes on the other hand the appearance of the canine teeth marks the final stage of dentition and the penultimate grinder precedes the two front grinders.

Embryological differences must not be left out of consideration. Eighty years ago Johann Friedrich Meckel, of Halle, discovered that during the period of immaturity, which lasts from the fertilization of the ovum to the first manifestations of sexual aptitudes, every animal passes through the various stages of development which characterise the lower forms of life during their whole existence. At birth the difference between the human infant and the monkey is comparatively small. It takes an expert to distinguish the skull of a child from that

* Huxley, *The Place of Man in Nature*, p. 105.

† Darwin, *Descent of Man*, i, p. 120.

of a chimpansee. In point of size there is little to choose; but an ape's brain does not grow much. Although it resembles the human brain in structure, its development follows quite a different course. The brain of the ape has as a rule stopped growing by the time the animal has got its second set of teeth, which is just the time when the real development of a child's brain begins. *Per contra* the facial bones of the ape grow more rapidly, so that the biggest monkeys have the brain of an infant combined with the jaws of an ox. So also the inter-maxillary bone disappears earlier in the human embryo than is the case with monkeys. It follows from all this that continued development can never turn a monkey into a man, for the evolution of the two types goes on in different directions, and the degree of divergence would therefore tend constantly to increase. In some of the lowest monkeys, whose development has been arrested, as is the case with the marmoset of Eastern Brazil, the brain-case approaches the human type more closely than that of the anthropoid apes.* It is therefore a vulgar error to suppose that the evolution hypothesis traces the descent of man to one of the four higher varieties of apes. Neither Darwin nor any of his followers have ever said anything of the kind, but have always maintained that the ancestors of the human race must have diverged from some long extinct variety of the catarrhine group in the early part of the tertiary epoch. In order to verify this hypothesis intermediate forms must be discovered connecting the eocene apes with the men of the present day. The chain of structural modification will then be complete. This missing link, however, will probably be found, not in Europe, which man seems first to have entered after his present stage of organization had been reached; but in Asia or Equatorial Africa, regions more likely *prima facie* to have been the cradle of the human race.

We have spoken thus far only of physical characters, which entitle man merely to rank in the animal kingdom as a sub-order of the Primates. These are what determine his place from the scientific point of view, which is all that we are now concerned with. In the later papers we hope to deal with some of the higher distinctions between men and animals.

* Virchow, *Menschen und Affenschädel*, p. 25.

In illustration of the different phases through which the question has passed the most notable classifications of men and monkeys are shown here—

Linnaeus. *Order of Primates.*

- 1st genus Homo
  - *species* sopieus
    - Ferus, (savage)
    - Americanus
    - Europaeus
    - Asiaticus
    - Asser (negro)
    - Monstruosus (abnormal)
  - *species.* Sylvestris or troglodytes: orang, etc.
- 2nd *genus.* Simia.
- 3rd *genus.* *Lemurs.*
- 4th *genus.* *Vespertilio.*

Cuvier 1828.

1st *order:* Bimana: Man.

- 2nd *order:* Quadrumana
  - 1st *family:* Monkeys.
    - 1st *tribe.* monkeys of old world.
    - 2nd *tribe.* monkeys of new world.
  - 2nd *family:* Marmosets.
  - 3rd *family.* Lemurs.

Huxley 1871.

- *Order* of Primates
  1. Anthropidæ: Man.
  2. Simiadae
     - Catarrhine
       - Anthropomorphic.
       - Cynomorphic.
     - Platyrrhine
     - Arctopitheca.
  3. Lemurs.

Broca 1870.

Order of *Primates.*

1st *family.* Man.
2nd *family.* Anthropoids (chimpansee, gorilla, orang, and gibbon).
3rd *family.* Pitheca (semnopitheca or sacred monkeys of India).
4th *family.* Cebia.
5th *family.* Lemurs.

Broca 1877–1880.

- Primates
  - 1st Anthropomorphi
    - A. Man.
    - B. Anthropoid.
  - 2nd Monkeys
    - C. Pitheca.
    - D. Cebia.

According to Huxley the different races of mankind fall naturally into two primary divisions; the *Ulotrichi*, with crisp or woolly hair, and the *Leiotrichi*, with smooth hair.

Among the *Ulotrichi* the colour of the skin ranges from yellowish-brown to the deepest charcoal-black. The hair and eyes are almost invariably dark, and the entire group, with the exception of the Andamanese, is dolichocephalic. The Negroes and Bushmen of Africa, and the Negritos of the Malay region, and of the Papuan islands belong to this stock. Some writers have proposed to include the Dravidians of India among them, but it may be doubted whether the physical characteristics of this type have yet been determined with sufficient certainty to enable the question to be finally settled.

The *Leiotrichi* or smooth-haired division are further divided into four groups :—

1. *Australioid* with dark skin, and eyes, wavy, black hair and long prognathous skulls with well developed brow ridges. The Australians are the chief representatives of this type, and Huxley also includes in it the inhabitants of the Dekhan and the ancient Egyptians. As regards the people of the Dekhan a doubt may be suggested, whether the data available are ample enough to justify this conclusion. One may also fairly ask what is meant by the phrase inhabitants of the Dekhan. Presumably the Dravidians, but the category is so large and indefinite that it may well give rise to some misapprehension. One is tempted to surmise that the people of the Dekhan have been included in this type on the strength of an examination of a limited number of Museum specimens, about the least trustworthy kind evidence that can be resorted to. No one who is acquainted with the conditions which govern the collection and preparation of skulls in India, can fail to regard with profound distrust any of the ordinary collections, for the simple reason that in nine cases out of ten there is, and from the nature of the case can be, no guarantee whatever that the skulls are what they are represented to be. Pending therefore the fuller examination and determination of the Dravidian type, which may perhaps be looked for, we may be permitted to suspend judgment on the question whether it should be included in the Australioid group.

2. Next in order comes the *Mongoloid* group, with usually yellowish brown or reddish brown skins and dark eyes, the hair being long, black, and straight. The characteristic Mongolian skull is brachycephalic ; in fact the most pronounced cases of brachycephaley are found among this group, and all Asiatic Mongols are markedly brachycephalic. On the other hand the American Mongols are usually dolichocephalic.

3. The *Xanthrochroic* group is marked by fair skins, blue eyes, and abundant fair hair. The skulls of the most typical members of the group are almost invariably dolichocephalic, indeed Penka (*Die Herkunft der Arier*) regards this as one of the chief characteristics of the Xanthochroic

Scandinavians; but in Southern Europe the brachycephalic representatives of the type out-number the dolichocephalic. Teutons, Scandinavians, Slavonians, and the fair Celts are the chief members of this group; but distant off-shoots are also found in North Africa and Western Asia.

4. The *Melanochroi*, or dark whites, have pale complexions, dark hair and eyes, and usually long, but sometimes broad skulls. In Europe they are represented by the Iberians and "black Celts" of Western Europe. Professor Huxley is inclined to think that they are not a distinct group, but result from the mixture of Australioids and Xanthochroi.

MARRIAGE CUSTOMS OF TIBET.—*By* Sarat Chandra Das, C. I. E

PART I.

The ancient Marriage Customs of Tibet,

(as now prevailing in Purang, Nah-ri, and the country round lake Manasárovara.)

Marriage by capture, as it now, to some extent, prevails in Purang and the country round lake Manasarovara existed in former times in Tibet and in the Cis-Himalayan countries. In U and Tsang comparatively few remnants of this ancient custom now remain, though in Sikkim, Bhutan, and the Himalayan district of Spiti near Kulu, a survival of it may be traced in the part played by the *Kûnchen* (thief) in marriage ceremonies.*

In Purang when a young man wishes to marry a girl, he watches her movements, and carefully ascertains the places where she frequently

* Spiti. *Polyandry.*—Marriage customs.—In Spiti polyandry is not recognised, as only the elder brother marries, and the younger ones become monks. But there is not the least aversion to the idea of two brothers cohabiting with the same woman, and, I believe, it often happens in an unrecognized way, particularly among the landless classes who send no sons into the monasteries. I heard in Spiti, that when the bridegroom's party goes to bring the bride from her father's house, they are met by a party of the bride's friends and relations who stop the path: hereupon a sham-fight of a very rough description ensues, in which the bridegroom and his friends, before they are allowed to pass, are well drubbed with good thick switches.

In Spiti there is a regular ceremony of divorce which is sometimes used when both parties consent. Husband and wife hold the ends of a thread, repeating meanwhile:—"One father and mother gave, another father and mother took away: as it was not our fate to agree, we separate with mutual good-will." The thread is then severed by applying a light to the middle. After a divorce a woman is at liberty to marry whom she pleases. (*Crooke's Notes and queries, &c.*).

goes for doing agricultural or pastoral work. When he finds a good opportunity he comes, accompanied by one or two of his friends, and tracks her to the field or to the pasture where she happens to go, and finding her alone carries her by force to his house. He keeps her confined in a separate house so as to have abundant opportunity of soliciting her favours. He provides her with good food and nice clothes and remains near her to coax her and to win her love. When he goes out of the house he leaves some one of his trusted friends to guard her against the seductions of other men and the attempts of her parents to take her away. Sometimes her parents come in search of her, or send men to fetch her home. If the girl be unwilling to live with her captor, or if her parents do not permit her to marry him, the matter is settled by the village elders or the tribunal of the *Jong-pon* (district chief). If they permit the union, an auspicious day is fixed for the marriage when a good deal of *chang* (wine) is consumed. The entertainment on the marriage occasion is therefore called *Chang-thûng* (drinking of wine).

Marriage by elopement:—When a girl has given her heart to a young man, but her parents will not let her marry him, she elopes with him. He is helped in the elopement by two or three sturdy friends, who accompany him to prevent a rescue on the part of the parents and to see the couple safely through. Having brought her to his home he accommodates her in a good house engaged for the purpose. Here he conceals her and enjoys the honey-moon, taking care to employ a number of strong men to guard his bride from being carried away by other men or by the friends of her parents. In the meantime his friends, or father, or relations go as *Lóng-mi* (begging men) to the house of the girl's father. They take with them some presents for him, and also provisions for their own use during the time they remain there. They do not venture to go near the house of the bride's parents, but remaining at a distance of about hundred yards or more from it, swing a *Khatag* (salutation scarf) to say that they have come to humbly propose the auspicious marriage of their daughter. At first the parents and their friends take no notice of this and decline to look at them. The *Lóng-mi* continue their silent entreaties for three or four days, and do not leave the place until by their importunity they have moved the hearts of the bride's parents. The father of the girl then brings them before the elders of the village, and asks the latter to inflict on them the punishment they deserve for having stolen his daughter.

If the *Lóng-mi* abide by their decision and pay the fine immediately, the marriage proposal is formally received by the bride's parents. In the meantime the bride returns to her father's house. Then an auspicious day is fixed for the wedding entertainment which is called *Chang-*

thûng, when the friends and relatives of the bridegroom come to fetch the bride to the bridegroom's place. The bridegroom being conscious of his guilt dare not visit the house of the bride's father, till a long time after the completion of the marriage If he indiscreetly happens to go there he is given the appellation of *Kûn-chen* (thief) and dealt accordingly.

Among the upper classes in Purang parents generally arrange for the marriage of their sons and daughters. First of all comes the betrothal.* When the parties betrothed reach the proper age, *i. e.*, about two or three years after attaining to puberty, they are married. The bridal party, which consist of the kinsmen and relations of the bridegroom, carrying with them presents of clothes for the bride, and provisions for the marriage entertainment, proceed on an auspicious day to fetch the bride from the house of her father. The friends of the bride erect nine stone cairns called *Tho-do* in the way each about a hundred yards apart from the other. The bridegroom's party wait at the ninth *Tho-do* which is farthest from the house of the bride's father, and in the hearing of the bride's friends, who come to meet them there, describe the personal beauty and accomplishments of the bride and the bridegroom, and also pointing to the *Tho-do* say that it is the first barrier that the demons have set up and that it bars their way like a mountain. If they depart from the customary description of the gods and the demons, or commit any mistake in the manner of describing the *Tho-do*, the friends of the bride become angry and break down the mound. Then the bridegroom's party must apologise and again describe the mound and the couple to be united. In this manner they halt at every one of the *Tho-do* and describe them according to the custom of the country. At the last *Tho-do* which is consecrated to the gods, they sing the praise of the bride, her parents

* Among Ladákis, betrothals, which are the occasion for a little drinking of tea and *chang*, are arranged by parents in consulation with relatives. Having fixed upon a match, which, from a worldly point of view, seems desirable, they then refer to the *Lámas*, to see if the destines of the proposed couple suit. If they are found to be unsuited the betrothal is given up. A youth is betrothed when he is about 20 years of age, and a girl perhaps two years earlier. After the betrothal or "*tea chang stär ches*," the wedding, or "*Pagston*" may take place within a month, or it may be put off for a year or more. If a male child possessing property, is left alone in the world, he is betrothed at once to some fully grown woman, who acts as his nurse during his childhood, and as his wife during his later years. This is not found an inconvenient practice as a Tibetan may have two "little wives" in addition to his original "*Pagston*" wife. The dowry (*Kinto*) is fixed at the time of betrothal, but it is not given till the marriage takes place, and some times even after that. This dowry is paid by the bridegroom to the father or other nearest relative of the bride. *Captain Ramsay's Western Tibetan Dictionarg*, p. 10.

any mistake in the manner of describing the *Tho-do*, the friends of the bride become angry and break down the mound. Then the bridegroom's party must apologise and again describe the mound and the couple to be united. In this manner they halt at every one of the *Tho-do* and describe them according to the custom of the country. At the last *Tho-do* which is consecrated to the gods, they sing the praise of the bride, her parents and their tutelary deity, and say that as they have come thus far after having surmounted the nine valleys and nine mountains (*La-gu* and *Lûng-gu*) they hope that the gods will help them in their mission.

At the house of the bride's father they are received with kindness and entertained with tea, *chang*, barley flour and the three kinds of meat, cooked, dry, and raw. They present a milch yak with her calf to the bride's mother as the price of the bride, called *nu-rin* (price of the mother's milk), and also two milch yaks to the father as the *Ñah-rin* (price for (his) back). They also make presents of money and scarves to the relations of the bride's parents, and return to the bridegroom's house with the bride and her dowry, &c.

Preliminaries of Marriage in U, Tsang and Sikkim.

Parents generally arrange for the marriage of their sons and daughters, when they have passed the age of puberty. At the outset of a marriage proposal, it is necessary for the parties to be furnished with the names of the years in which they and their respective parents were born. This is considered essential for the purpose of ascertaining the *Thun-tsi* calculation of the harmonious conditions of marriage in the parties to be united. For this object two or three astrologers are employed to arrive at independent results, working on different astrological data.

The request to astrologers for calculation is generally accompanied by some presents, consisting of *sum-tshan* (articles of three varieties), a tray full of rice, a quantity of barley flour and a few bottles of wine. Receiving these presents the astrologer spreads his astrological chart called *Tsi-thang*, on a little table, and places in front of it a jug full of wine to offer *serkem* (libation of golden drink) to the gods, a miniature flag called the *Dah-dar* (a silken flag of five colours attached to the sharp end of an arrow), and burning incense. He then puts a few white and black balls, of the size of a pea, on the chart, and throws them on it in the manner of dice to ascertain the good and bad luck of the parties to be married. After noting down the years of birth of the parties he gravely sits on a cushion to perform the ceremony of *Den-dar* (the test of Truth) of his calculations, and makes the following invocations :—

"I pay homage to Buddha—his Law, and the Church, and vow to be under their protection, till I shall have entered the state of supreme enlightenment. By the moral merits of my good deeds, such as charity, forbearance, &c., let all the living beings of the world be benefited, and thereby let me attain to Buddhahood. Let all the animate beings of the world come under the influence of TRUTH, and the causes of TRUTH, and also be free from misery, and the causes of misery. Let them also not be devoid of TRUTH, which is free from misery, and abide in that even state of mind, which is free from corruption, partiality and passions. Let me gain perfection as quickly as possible, that I may work in the cause of all living beings of the world. It is with a view to serve them in respect of the sciences of astrology and divination, that I now undertake to perform this religious service." With this introduction the officiating astrologer invokes the aid of all the gods of the ten quarters, Buddhas, Bodhisattvas, sages, saints, &c., to help him in the work of mystic calculation :—

"O holy Lamas who have passed away, are now present, and will appear hereafter in this world, pray, bear me out in this test of TRUTH! O, infallible prince of the Śákya race, O sage of Udyána, Padma Sambhava, O ye masters of the Sûtras, Tantras and the *mantras*, lend me your help in this test of divination for nothing in this world is hidden from you.

"O *Rig-sum Gon-po* (Mañju Śrí, Vajra páṇí, and Avalokíteśvara, Sańgye (Buddhas) Chańgsem (Bodhisattvas), the science of numbers and of the stars, the Sûtrántas and the sacred works on divine prophecies!—Judge ye all of my skill.

"O Brahmá Chaturmukha, thou with (four faces), oh Nága Rájá whose head is formed of seven serpents, O mighty *Vijayá* the goddess who rules over the elements, O sage Kapila Muni, O Kung-fu-tse (Confucius) the miraculous prince of China, oh saints and Vidyádharas!—Ye all are witnesses to my work.

"O the four great sages of China, the four saints of Tibet, and the Pandits and Lochávas of India and Tibet!—Help me in this test of TRUTH.

"O ye five kinds of Brahma-Káyika Devas, who rule over the fire in the South, over the wood in the East, over the adamantine mountains in the West, over the Ocean in the North, and over the ethereal space in the middle region!—Bear me out.

"The eight great planets, thes un and moon, the Pleiades and the 78 constellations!—Do ye all test the truth of my science.

"The great gods including the Brahmá, the eight *nága* demons headed by Nanda, the four Mahárája Káyikas, the guardian kings of the world, and the seventy *Palgon* (the noble spirits who defend Bud-

dhism)!—Help me in drawing true conclusions from astrology and the science of divination.

"The four celestial nymphs called Man-tsun Chen-mo, (Mahá Mátriká) who preside over medicine, the twelve sylvan goddesses called the Ten-ma Chuñi, who under a solemn compact have become protectors of Buddhism in Tibet, the local gods and demigods together with your attendants, the kings and ministers!—Bear ye all witness to my work.

"The nine mystic figures called the *Me-va gu*, and the eight gnomons on the chart of divination called the *Parkha* and the cycle of sixty years!—Receive homage from me.

"The grey tiger that keeps the farthest end of the Eastern quarter, the blue dragon of the South, the red huge bird of the West, and the golden tortoise of the North!—Receive your share of respect from me.

"I make this religious service which is threefold, being exoteric, esoteric and mystic to honour you, and I make offerings to you for granting me power to arrive at accurate results in calculating astrological events and to divine correctly. Will you, therefore, explain to me the science of divination, and demonstrate every fact and figure connected with it as clearly as reflections fall on a mirror of polished silver?

"To-day we are to ascertain whether the youth and the maiden to be united are possessed of the ten virtues of matrimonial concord (*m*thun-*s*byor); the twenty characteristics of demeanour (*h*gro-lam); If they will deserve the ten kinds of dowry, and also the services of five men necessary for conducting wedding ceremonies. Oh Venerable Lamas and learned elders, shew unto me all that is essential for astrology, and correct me when I err."

Then taking the names of the years of the birth of the males and females of both sides, the astrologer ascertains the chances of life, *i. e.*, (longevity), accidents to the body, power (*Wang-thang*) and prosperity (by observing the *R*luñ *r*ta (*wind-horse* or fortune) and by setting these four against each other by the throw of the black and white balls on the chart. The good and evil of life, and the *wind-horse* of the male's year being calculated, are set against those obtained from the female's year. Again the body and power of the female's year are set against those calculated from the male's year. If in the throw of the globules the white ones turn up in favour of the parties to be married, good luck is prognosticated, and the *Thun-tsi* is ascertained.

If the good and evil of the life of the male harmonize in the calculation with those of the life of the female, longevity is counted upon. If not the happiness of the couple will be short-lived.

If in the calculation the accidents to the body of the male agree with those of the female, the astrologer declares that the marriage will

be happy in respect of issue. Want of harmony in the persons of the parties indicates barrenness.

If the *Wang-thang* (power) of the male corresponds with that of the female, the astrologer declares that the parties will be prosperous in reference to wealth. Want of harmony in *Wang-thang* in the parties indicates poverty and waste of wealth.

If the *wind-horse* (fortune) of the male agrees with that of the female, the marriage is predicted to be a very happy one, as love and concord are sure to attend them, and to be the guiding principles of their life. If the *wind-horse* of the one run counter to that of the other, the marriage is pronounced to be unlucky and unhappy, as the parties would then constantly fall out.

When parties are anxious to be married in spite of adverse astrological results standing against the union, the astrologer ascertains how many of the circumstances are favourable to the parties, and how many against them. If they agree in three-fourths of the circumstances, religious observances are necessary to avert the dangers consequent on the disagreement in the remaining one-fourth, but when at least one-half of the circumstances stand against the parties, no religious observance is supposed to be of sufficient efficacy to avert the dangers of an inauspicious union. The proposal is then dropped, and another maiden is sought.

The Tibetans use different kinds of astrological charts and calculations which are based on Indian and Chinese methods. The astrologer failing one kind of calculation tries another. When astrology fails, divination, by deciphering the mystic marks on the back of the fabulous golden tortoise is resorted to. In this manner the astrologer of Tibet makes a busy trade of his craft, the like of which is seldom seen either in India or China. Among the priestly crafts of Tibet none is considered so lucrative as that of the astrologer.

As soon as the astrologer declares that the *Thun-tsi*, *i. e.*, the circumstances of harmony necessary in the marriage are favourable, the parents consult their friends and relations in order to ascertain the suitability of the match, and send one or two *Bar-mi* (go-betweens) to ascertain the views of the maternal uncle of the maiden selected regarding her marriage. He generally withholds his opinion under various excuses. According to the customs of the country the *Shañgpo* (maternal uncle) of a maiden is the real arbiter of her fate in the matter of marriage. Nothing can be settled without reference to him. When his leave is secured the marriage proposal can be formally made to the maiden's parents.

The *Bar-mi* with the permission of the *Shañgpo*, on an auspicious day during the increasing lunation of the month, proceed to the house

of the parents of the maiden to present them with the *Long-chang* (in Sikkim *Nang-chang*) and therewith formally make the proposal of marriage. The word *Long-chang* is derived from *Long* to beg or apply and *Chang* wine, meaning the present of wine to apply for marriage. In Sikkim the candidate for the maiden's hand accompanies the *Bar-mi*, but in Tibet the case is otherwise. On the way they observe omens and prognostics. If they see any empty vessel they turn back.

The *Long-chang* consists of the following: at least a gallon of wine, a silk scarf, five silver coins, and five or nine kinds of things placed on a tray. The *Long-chang* is required to be carried by a man who has been the father of several sons and daughters. Under no circumstances is a widower, or one who is childless, or whose children have died, allowed to carry it. The parents of the maiden receive the *Bar-mi* with politeness, and serve them with wine and tea. After emptying one or two cups of tea the *Bar-mi* present them with a scarf, and beg for leave to state their mission. The parents at first shew some indifference to their request and try to turn the conversation on some current topics of the day. The *Bar-mi* press the point they are interested in, and say that they have come with the *Long-chang* to beg for the gem (their daughter). They are then told that the giving up of the *Norbu* (gem) is no trifle, and so they should not be too sanguine about getting it.

If, after repeated entreaties, they succeed in getting any assurance of good will from the maiden's parents they open the wine bottle belonging to the *Long-chang* and pour wine into the cups of the friends and relations of the parents who happen to be present on the occasion. At this stage the parents make the following remarks:—

"According to the common saying of the country the maternal uncle is the owner of one half of the person of his niece or nephew just as half the cloth of a robe belongs to the sleeves. Accordingly if the maternal uncle of our daughter and also her relations and friends agree to the proposal, it will be possible for us to accept the *Long-chang*, but otherwise we must return it."

It is therefore necessary first of all to arrange the marriage business with the maternal uncle. The proverb says "both in marriage and merchandise there should be no kind of solicitation." So the party that has won the maternal uncle over to his side need not shew any anxiety for the acceptance of the *Long-chang*.

If the *Bar-mi* can any how induce the parents to drink a cup of wine from the *Long-chang* the betrothal is effected. But they studiously avoid partaking of any thing pertaining to the *Long-chang* before consulting the maternal uncle.

Marriage Ceremonies of Tibet (U and Tsang).

After accepting the *Long-chang* the parents of the maiden in consultation with the *Long-mi*, called *Bar-mi* in Sikkim, and the astrologer fix an auspicious date for celebrating the marriage.

The bridegroom remains at home. His friends and relations proceed to the house of the bride's parents to fetch her. No music nor dancing mark a Tibetan marriage at the outset.

On the appointed day the parents of the bride make the necessary preparations for receiving the bridegroom's party who come dressed in their best apparel. Being seated on low or high cushions according to their respective rank and position, the guests are regaled with tea and wine and dainty dishes. A quantity of barley flour, red potatoes, biscuits and cakes in wooden trays and meat (boiled, dried and raw) in brass and silver trays, are placed before the principal guests.

In the mean time the bride is taken to her toilet. First her hair is washed, to which she reluctantly submits, shedding tears at the idea of separation from her parents and friends. These try to console her with kisses and show of affection. Her nearest female relations come to soothe her mind with kind words. The bridesmaid (sent from the bridegroom's parents), comes to help her in her toilet. She plaits her hair and dresses the locks in the form of a crown decorating them with strings of pearl, and turquoises. She then puts on her ornaments of gold and silver, coral, amber, ruby and other precious stones.

The marriage festivities generally last for three days at the house of the bride's parents, when their friends and relations avail themselves of the opportunity of shewing their good-wishes to them by making presents to her. The parents first arrange for the dowry, then the relations send their presents, and last of all come the personal friends and acquaintances of the bride to make the bridal gifts and to wish her a long conjugal life, prosperity and happiness. The presents are then collected and made over to the best man with a list of them. As soon as he comes to receive them, the companions of the bride by way of of a joke, secretly remove his earring, head dress, wrapper or any other article they can get hold of belonging to him. At the time he takes no notice of their jokes, but in the following morning he complains to them about the loss of his things, and offers a reward for their recovery. A present of three to four *srang* (ounces of silver) to them secures him the return of the lost things.

A Tantrik priest called *Ñag-chang* performs the ceremony of propitiating the *Pholha* (the household god) with incense burnt at a conspicuous place. The representative of the bridegroom now makes

a present of nine or five varieties of articles to the mother of the bride, and says that as the usage of the country sanctions the offering of what is called the *Nu-rin* (the price of mother's milk) she must accept it.

When the bride leaves the house of her parents which is usually done a little before the dawn the *Ñag-chang* burns some incense to please the *nága* demons who (are supposed to) live under ground within the premises of her parents. These unseen beings are believed to be often attached to some individual member of a family so as to follow them like a dog wherever they happen to go. It is the duty of the *Nag-chang* to keep them back by the efficacy of his charms and prevent their following the bride to her husband's place.

The *su-mi* (the bridegroom's people who come to escort the bride) and *Kyel-mi* (men who escort her to her husband's place) and the *Bag-yog-ma* female attendant of the bride proceed to the altar of the household god of the family to take leave of him. They make three salutations to him each time taking their hats off.

Then coming out of the house they seat the bride on a stool placed at the door. A priest (of the Bon religion) now performs the ceremony of *Yangûg* (invoking good luck) by reciting some mystic charms and walking round her from right to left in the manner of a *Bon* religious circumambulation. When this is done, a small arrow studded with five precious stones and with five scraps of silk of five colours attached to its pinnacle, is fixed on the neck of her dress, its point touching the top of her head-dress. She is then placed on the back of a pony and slowly led to her future home. The parents with tears in their eyes now come to bid her farewell, and present her with the auspicious scarf called *Tashi Khatag*. They send the *Kyel chang* (farewell wine) to be served to her at a short distance from the gate of their residence.

The bridal party then proceeds towards the bridegroom's house, being heralded by what is called *Ta-kar*, *mi-kar* (a man in white riding on a white horse). An amulet containing some mystic charms to protect her against evil influences and the evil spirits of the ten quarters, is now worn by the bride. This is considered very essential for her well-being at this time. When a bride proceeds to her future home unprovided with this indispensable safeguard she is sure to fall under the malignant influence of evil spirits. For during her journey from the place where the farewell wine is served, *i. e.*, where she parts company with her parents and friends, and the place where she is first received with what is called the *welcome-wine*, she is not accompanied by any guardian spirit either from her father's side or from the bridegroom's quarter. As soon as the bride approaches the house of the bridegroom, a second batch of *Sumi* (people sent to receive the bride) dividing them-

selves into three parties, wait at three different stages on the way to refresh her with the *welcome wine.* At each of these places she stops a few minutes to receive the *welcome wine* and the auspicious scarves.

As soon as the bridal party arrives at the gate of the bridegroom's house, his friends fearing lest some evil spirits may have followed the bride from her father's place, make arrangements to drive them off. For this purpose they bring the devil's effigy made of cloth or barley painted with coloured butter, and throw it on the ground before the bride. The *kyelmi*, i. e., those who have come from her parents' house to escort her here take offence at this demonstration of groundless fear on the part of the bridegroom's people. They keep a sharp eye on the man who throws the devil's effigy, and, if possible, catch him in the act and tear his clothes to pieces by way of punishment. They let him off on extracting from him the promise of the payment of a fine of two or three *srangs.* In their turn they now try to find fault with the arrangements made for the bride's reception. It is customary to hang a piece of long silk scarf from the top of the gate on the occasion of the arrival of the bride. The bridegroom's people let the scarf drop for a moment and then lift it up. The bride's friends try to catch it and take it away to the bride's parents in token of their triumph over the bridegroom's party. Then the officiating Tantrik priest recites a few benedictory verses, &c., describing the door, house, &c. of the bridegroom.

"Hail, self-existent Dharma! Let there be happiness to all living beings. The lintel of this door is yellow, being made of gold. The door posts are cut out of blocks of turquoise. The sill is made of silver. The door frame is made of lapiz lazuli. Opening this auspicious door you find in it the repository of five kinds of precious things. Blessed are they who live in such a house. Let them enjoy long life without being troubled with sufferings and dangers. Prosperity be theirs, and let there be no limit to their wealth. Oh happy couple, if you wish to found a family you should first pay homage to the three Holies (Buddha, Dharma and Sangha). Secondly you should extend your charity to the poor and the fallen. Thirdly your compassion to all living beings should be unlimited. We come from our fatherland, the country of gems, to open the mines of five precious metals, and to plant the root of generation. We have come indeed to execute a high mission, so do not close the door against us. Open it that we may enter."

Then the mother of the bridegroom, dressed in her best apparel, with a tray containing the *Dah-dar* and some barley flour mixed with butter, in her right hand and with a jar full of milk in her left hand, comes to receive the bride and to present her with the *Tashi khatag* and *che-mar* (the buttered barley). The bride helped by two female at-

tendants alights on a stool which is covered with a rug containing the figure of the *swastika*. She is conducted by her mother-in-law to the marriage altar, and seated to the left of the bridegroom.

The carpet on which they sit usually contains the figure of the *swastika* and the floor of the room is painted with a paste made of wheat flour and water. The bridal party consisting of the *kyel-mi* and the *su-mi*, then enter the reception hall after tasting a little *che-mar* (buttered barley), at the threshold. The friends of the bridegroom sit in the left row, the seats on the right row being reserved for those who come on behalf of the bride's parents. A sumptuous dinner is served to them. In the meantime the friends and relations of the bridegroom come to offer their *Tashi-katag* (auspicious scarves) to the married couple, and to make presents to them. It is customary with them to supply the provisions necessary for the entertainment of the first day. On this occasion all the neighbours of the bridegroom also take part in the festivities and make presents of cloth, gold, silver, &c., with auspicious scarves according to their means and taste.

Music and singing are kept up throughout the day. Then when the auspicious hour of solemnizing the marriage arrives the *Ñag-chang* makes offerings to the gods, and gives a new name to the bride, connecting it in some manner with the name of her mother-in-law. When this is performed a small piece of wood, about six inches long, is held to the lips of the bridegroom. The bride now sits in front of her husband, and takes the other end of the wood between her lips.

In the mean time a tuft of wool is placed in the hands of the bridegroom who draws out the fibres to some length. The bride takes it from his hands and twists it into a thread. This is called the ceremony of the first work of harmonious union. Then the party of the bride separate from that of the bridegroom, and sitting in rows of seats facing each other sing repartee songs. When the festivities terminate the bridegroom dismisses the *Kyel-mi* with suitable presents.

PART II.

Marriage customs in Sikkim.

The marriage ceremony takes place generally a year after the acceptance of the *Nang-chang* though it is not unusual with the rich to have it performed after six months when the parties to be united are of proper age. On this occasion too, the influence of the *Ashang* (maternal uncle) continues to be paramount. The party of the bridegroom entertains him with rich food and wine to obtain his final sanction to the marriage The entertainment that is given to him is called *Den-chûng*. The suitor

however, poor he may be, must, at least contribute a roast fowl to the dainty feast that is prepared for him.

The *Bar-mi* (intermediators) settle the price of the bride with her parents, who say that the *gem* in question being very valuable cannot be parted with easily. At last the price is settled, which among the poor people of Tibet living in the frontier generally comes to a few score of *Tankas* or *srangs* according to the resources of the bridegroom. The *Bar-mi* then take the permission of the bride's parents to appoint an auspicious day for celebrating the marriage ceremony. This done their duties are at an end.

The maternal uncles of the parties or their representatives now come forward to conduct the marriage as *Dodag* (managers). In Sikkim and Bhutan the *Dodags* are furnished by the respective parties with what is called *Bar-zen* (the mediator's fee) usually estimated at ten per cent. of the price of the bride.

So long as the marriage is not completed, the position of the bridegroom is considered to be that of a suppliant beggar. In Tibet he is received with some consideration, but in Sikkim and Bhutan his position is far from being enviable. But as soon as the marriage is settled, and the price of the bride fixed, his maternal uncle begins to assume a position of equality with that of the bride's maternal uncle.

He cites the common saying. "*Da-va mé-na ñen mi-kyab.*" Where equality (of position) is wanting there should be no marriage.

The question now arises where should the two parties meet to conduct the wedding ceremony. The suitor's maternal uncle endeavours to have it done according to the old customs of the country at an intermediate place between the residences of the two parties, but the bride's party do not agree to this. At last the former yields to the latter, and the wedding takes place at the residence of the bride's parents.

On the day of marriage the *Bar-mi* again meet for the definite settlement or payment of the price of the bride. They are paid the usual mediation fee of five *rupees* or *srang* from each side.

If the bride belongs to the higher class, *i. e.*, the nobility she is valued at 18 ponies (each pony being valued at Rs. 50) and a present of nine articles called the *gu-tshan* consisting of the following:—a gold *mohar*, eight ounces of silver, a silk robe, a matchlock, a robe of thick Tibetan, serge, called *Purug-go*, *Khamar* (wrapper made of raw silk), *Baborma* (a good milch cow with a calf), a silk scarf of superior quality.

The price of a bride among the middle class is estimated at 12 ponies and a present of five different articles.

In the case of the poor the price of a pony is estimated at 50 lbs. of

butter. If it is understood that the bride will bring with her a male and female slave her price is raised by two ponies and the entire carcass of a pig or sheep thrown in.

The value of a bride among the common people is fixed at 4 ponies with a present of three things called the *Sum-tshan.*

According to the common saying of the country, the price of a bride is in fact due to the mother. In Tibet it is called *nu-rin* (the price of mother's milk). The mother does not personally accept it on any account, but when parents do receive it according to the usage of the country, it is understood that double the amount of the price received should be given to the bride as *Peejong* (dowry). This dowry becomes *Peema*—the personal property of the bride, and corresponds with what is called *Stridhan* in India.

When the marriage takes place at an intermediate place, the provisions necessary for the entertainment are supplied by both the parties—the largest share being borne by the bridegroom. In Sikkim he is required to furnish what is called *Shya-gyu*—the carcass of a bull slaughtered for the occasion. When the marriage takes place at the house of the bride's parents they entertain their relations, friends and neighbours for one whole day with rich dishes and *chang.* The wedding ceremony takes place at or before noon, when the *Don-ñer* or *Khalenpa* delivers a harangue to the assembled people—and invokes the gods and the spirits of the ten quarters.

A respectable man of the village, who is blessed with sons and daughters, and has means, is appointed to perform the *Khalen* as follows:—"The three Holies (Buddha, Dharma and Sañgha), the united body of the sainted Lamas, the spirits of the ten quarters, the guardian gods and defenders of Buddhism, the four great spirit kings, the snowy mountain Himalaya, the divine keepers of the sacred places and sites, the tutelary deities and guardian angels, and such other gods and spirits whom the parents of the bridegroom and bride propitiate, and ye celestial beings henceforth protect this married couple, named—and —. From this day he will be hers and she his. They will be mutually responsible to each other for their respective conduct.

"He will not allow her to be ravished, or seduced by another man, nor will she allow him to fall under the influence of another woman. He will not in any way deprive her of her personal properties, nor allow other men more or less powerful than himself to rob or purloin her personal effects. They are united together this day in our presence, and ye gods and saints bear witness to their wedding." To this the couple, seated by each other's side, nod assent when the *Don-ñer* throws a fine white silk scarf called *Tashi khadag* on their heads.

Then the relations and friends of the bride and bridegroom present them each with a silk scarf, and in terms of affection wish them a happy life. This ends the first stage of the marriage ceremony called *ñen*, marriage. Though the price of the bride has been paid, and the *Khalen-pa* has announced the wedding to the public, yet the married couple are not permitted to enjoy the honeymoon until a year has expired, or till the festivity of *Chang-thûng* (drinking) has been performed. During this time the bridegroom is required to make frequent visits to his father-in-law's house with fancy presents for his spouse. In fact, this is the period of courtship with Tibetan-speaking people. Among the agricultural tribes of Sikkim and Bhutan this period is called *Dor-gyug* (the period of servitude). The common saying among them is that "a son-in-law, though he is not a slave, must serve his father-in-law and mother-in-law, for at least three years before he can enjoy the person of his bride." This term of three years in the case of the lower classes is counted from the time of *Long-chang*. Among the higher classes betrothal, marriage and *Chang-thung* are all finished within a year. It is in the case of the middle classes that these ceremonies extend over two years. The period of *Dor-gyug* among the humbler classes can be conveniently shortened by payment of money, or by the present of five varieties of articles to the bride's parents.

Chang-thûng (the festival of drinking).

This final ceremony of marriage generally takes place one year after the *ñen* (formal marriage). The bridegroom again sends two *Bar-mi* to ascertain the wishes of the bride's parents regarding the time of *Chang-thûng*. This is considered the most delicate part of the marriage business or (*Behu bumoi lon joi*) as it is called in Sikkim and Bhutan. The parents and friends of the bride try on the slightest pretence to postpone it indefinitely in order to extract more service from the bridegroom. The *Bar-mi* therefore exert themselves with much tact and care to ensure success in inducing the brides's parents to agree to *Chang-thûng*. This being arranged, they consult the astrologer to fix an auspicious day for commencing the festivities and to prepare the bride's horoscope. The marriage hour called *Bag-kar*, (the *marriage star*) occurs only once in a month, so the day in which the auspicious hour falls is selected for the wedding.

The festivity of *Chang-thûng* extends over six days, the entertainment of the first three days takes place in the house of the bride's parents, and that of the remaining three days in the bridegroom's place.

The first day of the festivity is called the *Dóng-chang*, *i. e.*, the day of the first drinking, when the *Donñer* again invokes the gods and spirits

in the terms stated above. The second day of the festivity is called *Chang-thûng-chenpo, i. e.*, the day of grand drinking when also the *Khalen* is made with much warmth. As soon as the *Donñer* finishes his harangue the Tashi-kyi-Lama begins his work—the ritual of auspicious offerings to the gods and spirits. These offerings, called *Tashi Torma* are made of barley flour and wheat decorated with wafers made of coloured butter, in the shape of *chaityas* and fancy temple-like structures. With these the head of the bride is first touched and then they are thrown towards the spirits, who are supposed to have assembled in space at the exhortation of the Lama. The third day of the festivity is called *Chang-ser, i. e.*, the day of the golden drink.

On the evening before the *Dong-chang* the bridegroom's people proceed to fetch the bride. The party consists of one or two valets of the bridegroom, four or five of his relations including the *Ashang* (maternal uncle) who generally performs the *rôle* of the best man, two or three men called the *Na-thi* (guides of the bridal party), the *Pag-ró* (bride's maid) the *Khyûng bag-ko* (the maid of honour), the bride's page who carries the bride's jewellery, &c., and a number of servants. The bridegroom's valet performs the part of the thief (*kûn-chen*) which is considered a dishonourable and odious duty in the marriage affairs of these cis-Himalayan countries. The bridesmaid sits by the side of the bride and covers her lap with a piece of silken wrapper called the *Pang-khep*. All these people who form the bridal party, are selected according to the directions supplied by the astrologer, and are supposed to be well-to-do people of good fortune. No widower, widow, or *Tshang-nag-pa* (husband and wife, to whom no son has been born) or *Rab-ché* (those who are barren) are ever allowed to join a bridal party.

In the morning preceding the day of *Dóng-chang*, the order and arrangement of seats for the people coming from the bridegroom's house, and also for those belonging to the bride's parents are settled. The *sûmi* come in the evening of that day, but the *kûn-chen* knowing how he will be dealt with by the bride's friends, loiters behind to seek for an opportunity to enter the house of the bride's parents in a secret manner. In his endeavour to do so he is assisted by the bridegroom, who having been in the house of the bride's father, has become acquainted with every detail of it. The fencing round the house of the bride's parents is covered with the branches of thorny plants and nettles. Two additional fences are erected at some distance from the house for the purpose of stopping the *kun-chen* and also to prevent his running away from the place.

Guards are stationed at each of these fences to watch the movements of the *kun-chen* who nevertheless succeeds in entering the house

either by scaling them, or by some kind of strategy. With the exception of the *Pag-pon* and one or two of his respectable companions, the rest of the party are treated with sham contempt and mockery. When others are served with good *chang*, bad *chang* refuse and coarse kind of food, intended for pigs, &c., are placed before them. These not unfrequently exchange sharp words with the female friends and companions of the bride, who sometimes in the way of joke, sometimes in earnest, seek an opportunity to annoy them. If they be a quiet sort of people they generally settle the sham difference with these women by a bribe called *mag-lóg* (the fee of defeat).

The *kun-chen* in the dead of night, when all the guards are asleep, makes his way to the place of the bride's parents by either scaling the fences or breaking through them. He comes provided with a pair of leather, or felt boots, and some woollen, or thick sackcloth. On his arrival at the door of the house, he finds that it has been closed from within.

At this time the bridegroom tries all his resources to get him inside the house. He calls the *kun-chen* by signs or by a whistle to enter the house by lifting up some of the loose planks of the floor from underneath, the *hog-khang* where pigs and cattle are kept. Sometimes he points out to him the weak part of the roof or a bamboo wall of the house through which a passage is possible. If possible the bridegroom quietly comes out of the house to help the *kun-chen*. If the female relatives of the bride happen to be awake, they light torches called (*Bag-zi*) to beat him. Some among them being friendly, or brought to his side, by bribe try to extinguish the light. As soon as the *kun-chen* enters the house he at once wraps himself up with all the clothes that he can get hold of therein. The women now come headed by the bride's sister to beat him with switches and thorny twigs in their hands. In spite of the help that he can obtain from those that are friendly to him, he gets a thorough beating. The more violent among the women beat him mercilessly, as if he were the real enemy of the bride. Unable to bear the beating, the *kun-chen* sometimes abuses them, and sometimes he falls on his knees to beg for forgiveness. Sometimes he feigns exhaustion, and falling prostrate on the ground, salutes them saying, "O merciful ladies forgive me. I shall pay the *mag-lóg* (the fee of defeat)." If they do not beat him severely, he remains on the ground as if motionless, or half dead, and does not pay the *mag-lóg*, and at the end appropriates to himself the articles of *mag-lóg* which the bridegroom gives him to compensate his supposed loss in the way of *mag-lóg*.

Sometimes the *kun-chen* behaves very humbly towards the female friends of the bride, in consequence of which they treat him with less

severity, but under no circumstance can he escape the beating altogether. In the morning of the first day of *chang-thûng* called the *Dóng-chang*, he is placed in a conspicuous place in the reception room, wrapped up in blankets and other thick stuffs.

Dóng-chang :—In the morning at about 8 o'clock, the guests consisting of the relations, friends, neighbours, &c., begin to assemble in the marriage hall. They bring with them each a basketful of *chang*, a bag of rice, and a potful of barley flour. Each guest, as he enters the hall, strikes the *kun-chen* lightly with the switch kept there for the purpose. The *kun-chen* expresses his pains in loud shrieks. Sometimes when wanton boys apply the switch freely to his body, he will rush at them furiously. When the *kun-chen* goes out to attend the call of nature, he is surrounded by the female friends of the bride, and is forced to sit on a log of the tree called *sam-shing*, the raw bark of which produces a blister when it touches the skin. The log is covered with nettles and other thorny plants so as to look like a horse. If he can be made to sit on the wooden horse they will hoot him with shrieks and laughter. If he does not sit upon it they beat him with nettles till he enters the room.

Chang-thûng chenpo :—On the second day of the festivities the neighbours, friends and relations of the bride's parents are entertained with wine, rice, meat, &c. The guests headed by the chief priest of the village called *Tashi-kyi Lama*, present their respective scarves together with silver coins, clothes, metal utensils, and *Tashi kha-tag* to the bride and express their good wishes for her. Some among the guests, who are near and dear to the bride, will present her with two or more scarves, saying that they present this scarf called the *kyidar* (the scarf of happiness) that scarf called *gadar* (scarf of joy) to wish her gladness, and so on. The guests also make present of *Tang-dar*, *i. e.*, a scarf with a Tibetan *Tanka* or a *rupee*, to the *Pag-pon*, *i. e.*, the best man and the bride's maid. As soon as the scarves and other presents are brought the *don-ñer* (receiver of guests) announces the name of each donor. The money presents are deposited in a silver pot kept for the purpose, on a small table before the bride. Then some one from among the bridegroom's friends acknowledges the presents, &c., by saying *thug-je che* (great mercy). At this time the *kun-chen* remains in his solitary seat, but unmolested by any body. Till midday he finds himself very solitary as no one talks to him or makes any fun with him. When the presentation of scarves and *Tang-dar* is finished, the guests sit at dinner, and drink *chang* to their heart's content. After dinner the guests touch the *kun-chen's* head with their sticks. Some beat him lightly with the switch. This is called *solgyab* after-dinner beating.

The guests are served with *chang* and tea in the afternoon when they again play the same kind of practical joke with the *kun-chen*. This is called the *chang-gyab*, (beating after drinking). In the evening buttered tea is served to them with barley flour or parched Indian corn. Again they beat the unfortunate *kun-chen* lightly with their sticks. This is called after evening tea beating. When he has quietly undergone these indignities, the women taking pity on him cease to beat him any more. They ask him to drink *chang*. Sometimes a wooden bucket filled with *chang* is given to him. A servant then hands over to him a china-cup called *yangtse* with which he draws wine from the bucket. Then a trayful of half baked beef or fowl, mixed with red pepper and kitchen soot is placed before him. The female friends of the bride again come to annoy him. This time, catching him by his ears they force a quantity of under-done beef into his mouth. Some make him drink *chang*. Then the principal guests sing some benedictory songs, and offering their prayer to the Buddhas and the Boddhisattvas, to bless the married couple, they return to their respective homes.

Chang-ser :—On the third day of the festival called the *golden drinking*, the neighbours and relations of the bride's parents again assemble to a grand dinner and drinking, when large quantities of beef and pork are given to them to eat. Two or more oxen or pigs that have been slaughtered on the previous day, are cooked in large caldrons with red pepper and salt. The beef and pork so prepared, are called *shya-gyu* and *sha-phag* respectably. At midnight of the third day the *kun-chen* runs away quietly. If the women can catch him while running away they give him a good beating which is called *Dol-ñon*, (the beating before he escapes.) It is for this reason that the mother of the bride takes especial care of him and secretly arranges for his flight. The *kun-chen* having effected his escape, proceeds to the rest-house that has been especially erected for the bridal party midway and waitst here. Here he changes his clothes and becomes transformed into a great man called the *Tha-pon*. The bride's mother sends some wine, beef and rice for his refreshment.

When the festivities at the house of the bride's parents terminate, the officiating Lama makes offerings to the gods at the auspicious moments called the *Du-tsi jor* (in *Sanskrit* Amṛita yoga), the moments called *chi-jor*, the conjunction of the malignant stars, being avoided.

The offerings are first applied to the heads of the bride's parents and then thrown away, generally at the junction of two roads. At the same auspicious time the bride sets off for her future home. The astrologer now furnishes instructions on the following points :—

1. In what direction the bride should first look on starting.

2. What food or thing she should taste on her arrival at her husband's house.

3. What should be the year of birth of the woman who dresses her hair.

4. To what work the bride should put her hands first.

5. What should be the year of birth of "*Pag-pon*" the best man.

6. The name of the man, who should first serve the bride with food.

7. The name of the man who should conduct her to her husband's house.

8. What should be the colour of the horse to be used for her conveyance.

9. The colour of the cushion, on which she should sit on arriving at her husband's house.

The bridal party start early in the morning. The bride is now surrounded by her friends and female relations, who shed tears on parting with her. The *Pag-pon* (best man), the bridesmaid, *khyûn-bag-ko*, and other attendants who form the *Sûmi*, take charge of her from her parents. Some of her father's relations and friends join the party to escort her safely to the bridegroom's house. All the people who form the bridal party are called *kún don*. If the bridegroom's house be a day's journey distant the *kún don* halt at some convenient place midway for refreshment, where a tent or temporary shed has been erected for the purpose. At this time they are not allowed admission into any dwelling house. It is believed that a malignant spirit called *Dong-ser-geg* always walks before the bride, and those who fall in his way suffer all kinds of danger. It is for this reason that passers-by turn aside when they happen to come across a bridal party.

Here the *kun-chen*, now transformed into a great man, waits for the bridal party. He is called the *Ṭha-pon* (hawk-chief), for having come out of the ordeal successfully, *i. e.*, having snatched away the bride from the midst of her parents and friends like a hawk. Here he becomes the leader of the party, his position being second only to that of the *Pag-pon* (best man).

In the meantime the bridegroom sends another party of *Sûmi* with *Chang-gyûg* (wine for welcoming) to receive the bridal party. These dividing themselves into three parties, wait on the way in three stages. They carry with them a number of bamboo bottles of boiled *chang* and reeds for sucking the liquor from them, and one or two heavy loads of fermented *Chang* (*mur-wa* beer). At each stage they burn incense to the gods in large quantities for the purpose of purifying the atmosphere and also to drive away the evil spirits.

The first division of *Sûmi*, that meet the bridal party midway,

inform the *Tha-pon* of the health of the bridegroom and the arrangements for their reception, and the *Tha-pon* in a short speech asks them to partake of the *welcoming wine* sent for their reception and refreshment. He first invokes the gods, &c., then drinks *Chang*. The invocation consists of the following:—

"The highest reverence is due to the three Holies. The guardian deities and tutelary deities claim our adoration with precious objects. By the blessings of the Lamas and the kind advice and predictions of the Dákinís angels that soar on high, we succeed in all our worldly undertakings. The secrets of our success are supplied by the tutelary deities and the Dharmapálas protect us by driving away the evil spirits from our neighbourhood. Let all the dangers and accidents to life that await us be averted! Listen to our prayers, and in return for the service we have rendered to you grant us health, wealth, and all that the married couple may be in need of. Oh extend your helping hands to them at all times."

Those who wait at the second stage raise a bower of green branches and leaves of trees for receiving the bride. Here a fire is kept burning and water boiling in a large caldron. This is called the *Thab-so* (keeping of the hearth). A kid is kept tied to a post at the entrance of the bower. Two or three long bamboo bottles called *Pádûn* filled with water and decorated with wreathes of flowers are also kept outside the entrance of the bower. Here the bridal party is regaled with *chang* and tea.

The last place where the bridal party is given the most cordial welcome is the *Tangra* (outer courtyard) of the bridegroom's house. Here a man waits with a wooden tray containing the *Chang-ki Yang-tse* (a large cup full of wine) on the brim of which are stuck five crumbs of buttered barley called the *yaga*, a quantity of *chemar* (butter and barley flour mixed together) and the *Dah-dar* (arrow with the five coloured flags at its pinnacle). The bridal party as they enter the courtyard touch the wine and other articles at the entrance.

In the bridegroom's house his mother makes the necessary arrangement for the reception of the bride and the *Kûndon* (bridal party). She prepares the marriage cake service called the *Ama-kha-don* (mother's first entertainment). This consists of cooked rice, buttered barley flour, a ball of butter, cakes and some fruits. In a separate vessel is kept the food intended for the bride, which she is to taste first according to the directions of the astrologer.

The *Tashi-kyi-Lama*, who has constructed some fancy cakes painted with coloured butter for offering to the gods and the spirits of the ten quarters, now draws some mystic figures on a small table for the *Yang-*

gûg (invoking the goddess of luck and fortune). A priest with a sacred book in his arms stands behind the door to touch the head of the bride with it as she enters the room. He must not stay there after doing his work. The *Pag-pon* will beat him with a stick if he finds the priest lurking there. The object of touching the head of the bride with a sacred book is to prevent any evil spirit that may have come with the bride from entering the house. If the priest fails to touch her he is severely punished. At this time a gun (generally a matchlock) is fired to frighten the evil spirit so that he may run away as quickly as possible.

Then the *kûndon* headed by the *Pag-pon* take their respective seats. The *Tashi-kyi-Lama* sits at the top of the central row of seats. When they are served with tea and *chang*, the *Ama-kha-don* is brought and placed before them. The *Ṭha-pon* (who on the preceding day acted the part of the *Kûn-chen* or thief) now dressed like a chief comes forward to address the assembly, on behalf of the mother of the bridegroom, and tells them that everything has been arranged according to the custom of the country, and that the *Ama-kha-don* has been placed before them for their acceptance. Then the *Don-ñer* (receiver of guests) as the representative of the father of the bridegroom, presenting compliments, inquires of the health of the *Kûndon* if they have not been much fatigued on account of the journey, the difficulty of passage and the want of bridges over the hill torrents, &c. The *Pag-pon* replies to his queries in polite language. After some conversation and exchange of congratulations they begin to refresh themselves with tea and *chang*. Dainty dishes are served to them at noon, or a little after it. This day is called the *Dóng chang* at the bridegroom's house. All the provisions required for the entertainment on this day are supplied by the sister and brother-in-law of the bridegroom. If they be poor the bridegroom's parents meet the expenses. The *Ṭha-pon* who while performing the part of the *Kun-chen* had suffered so many indignities from the hands of the bride's female friends now receives his reward. He is furnished with presents in money, rice, barley flour, meat and *chang*.

On the second day of entertainment which is called *Chang-thûng chenpo*, the relations and neighbours of the bridegroom assemble together when a sumptuous dinner is served to them. Before touching the food, one of them invokes the gods, demi-gods, Buddhas, Bodhisattvas and the guardian spirits to protect the married couple. Then the *Tashi-kyi-Lama* recites the grace.

Marriage customs, &c., of Ladak.

After the "betrothal" ceremony has been performed, a month or two is usually allowed to elapse before the wedding takes place, though some times a year or more

passes between the time of betrothal and the time of marriage. When a day has been fixed for the marriage, the procedure is as follows:—On the day fixed, the relatives (*nien*) of the bride (*Pakma*) assemble at the bride's house and those of the bridegroom (*Pakphe*) at the bridegroom's house. At nightfall the bridegroom goes with five or seven of his friends (*ngiápa*) to the bride's house, he finds the outer door (*giázgho*) of the yard (*stara*) shut, and guarded by male relatives of the bride, he gives a few rupees to them, and they then allow him to enter, but when passing between this gate and the door leading into the house itself (*giázghoi nángkuk*) he is surrounded by the bride's female relatives, who pretend to be angry, and beat him with small sticks. To these also the bridegroom has to give a few rupees, and he is then allowed to enter the house. The bridegroom, with his friends, is then feasted by the bride's relatives, but the bride does not appear. Much "*chang*" drinking, music and dancing is indulged in, till about 1 or 2 o'clock the next morning, when the best man (*ngiátheetpa*) or (*ngiáthritpa*) accompaned by some of the older male relatives of the bridegroom, goes to the kitchen (*makhang*) in company with the parents and relatives of the bride. The bridegroom and the rest of his party do not go to the kitchen.

The guests take their seats in the kitchen, and each one puts his drinking cup (*norey*) on the ground in front of him and "*chang*" is then handed round by a male relative of the bride's, accompanied by one of the female relatives, who has a stick in one hand. The latter takes up the cup of each guest in turn and fills it, and if the guest fail to drink freely, she beats him. This ceremony is called "*nanchang*" or "insistence *chang*." During this time a ceremony known as "*thohloo*" is taking place, it is enacted by two old men, one being a relative of the bride, and the other a relative of the bridegroom. First the relative of the bride gets up and sings a sonnet in praise of the bridegroom; the other old man must then get up and reply, by singing a similar sonnet in praise of the bride, after which the first man again sings, and so for two or three times; if either singer fails to reply to the other, he has to give the other party a few rupees, or a goat, &c. At this time the bride's parents stretch a rope across the room, and on it they hang all the clothes, ornaments, &c., which constitute the "trousseau" of the bride, any cash there may be as a "*dot*" is counted and placed in a box. These clothes, &c., are called "*raktak*." A list of the articles is then made out; it is called "*Zongeek*," and is carefully kept, as a record of all the fine things given on the occasion. The best man then takes possession of the "*raktak*" and remarks that it is getting late, and that he would be glad if the bride could be made over to him.

The bride's relatives then protest that they don't know where the bride is, as her girl friends (*yátó-dzámo*) have hidden her. The best man has to give a few rupees to the *yátó-dzámo*, who then produce the bride, who is in a flood of tears (often genuine), and lead her up to her mother. The bride then embraces the feet of her mother, father, brothers, and other relatives, after which the best man puts on the bride's head a hat called "*sham skor-i-teebi*" (with very broad brim, fur lined underneath, and velvet covered above), and over that he fastens a "*khatak*" or scarf of salutation and then the bride's mother's brother (*Azhang*) takes the bride upon his back and carries her out to the "*Giázho*" where a horse is in waiting for her. The first to leave the bride's house is the *ngiáthee-pa* (best man) who is followed by the *ngiópa* (bride's relatives), then comes the bridegroom's relatives, then comes the bride (*Pakma*), who has not yet been seen or spoken to, on that day, by the bridegroom, and the rear is brought up by the bride's friends, musi-

cians and spectators. As the wedding party passes by other villages, on its way to the bridegroom's house, the villagers come out with offerings of satoo, ghee, &c., called "*kalchor*." The *ngiotheepa* touches these offerings and remits them, and gives a small present to the persons bringing them.

On arrival at the bridegroom's house, the door is found open, and in front of it are some Lámás (priests).

The bridegroom and his party dismount, and beg the bride to dismount; she, weeping all the time, refuses to do so, but eventually the bridegroom's friends give her a present of a horse or a rupee or two, according to their wealth, and she then dismounts. Bride and bridegroom then stand up in front of the Lámás, with clasped hands and bowed heads, and certain prayers are read. The prayer book is held by a novice or Lama of low rank, and the *Hlobon* or head Lama reads from it. While doing so, he holds in his left hand a bell (*treeloo*) and a small drum (*daroo*), and in his right hand, a sceptre (*dorjey*) and some grains of rice and barley. He rings the bell and sounds the drum with his left hand, and with the right he scatters the grain over the heads of the young couple. The bridal party then enter the bridegroom's house where they find two mystic signs, traced by the Lamas in barley or other grain, on the floor. On one of these the bride sits, and on the other the bridegroom.

Between them is placed a measure, filled with grain, in which is an arrow standing up, and having a small pinnacle of clarified butter affixed to its top. The bridegroom's mother then offers "*chang*" to the bride and bridegroom, after which a Lámá comes and sprinkles them with holy water. This completes the religious part of the ceremony. The bridegroom, with all the males of the party, then goes to another room where dancing, and merriment takes place. The bride, with all the women of the party, remains behind. After remaining a while, watching the dancing, the bridegroom is permitted to retire and rejoin his bride. During the whole of the next day, the merriment is kept up, and in the afternoon the bride, dressed out in all her best, and wearing all the jewels she possesses, comes out with her husband and walks round to shew herself off. She has to dance with the ladies of the party, and the bridegroom with the men. Having done this, they are at liberty to retire. The feasting is kept up that night, and the next day the guests go off to their respective homes. For seven days, bride and bridegroom remain in their house, but on the eighth day must start on a journey, to make their bow to all their relatives. Having performed this duty, they return to their home, and begin their ordinary married life.[1]

Then the bridegroom and the bride are seated on two square cushions placed side by side touching each other, and the wedding vow is solemnly administered to them. The bridegroom accepts the bride as his, and she accepts him as hers. To this the gods and the spirits of the ten quarters, the saints, Buddhas, &c., are all invoked to bear testimony. Then the *Don-ñer* coming out of the wedding-hall loudly proclaims to all present on the occasion and assembled in the court yard, that he (the bridegroom) born of such family and such tribe, is married to her (the bride) born of such family and such tribe and to this union the gods

1 *Captain Ramsay's Western Tibetan Dictionary*, pp. 97 and 98.

above, the *Nagas* below, *i. e.*, from their abodes in the nether world, and the spirits of the middle region, *i. e.*, atmosphere, bear witness.

When this is finished fresh *chang* is poured from a jug in two cups, and presented to the bride and bridegroom. As soon as they have taken a sip or two of this *chang*, the parents of the bridegroom lift their respective wine cups to their lips to drink, when the guests follow their example. At noon the *Tashi-kyi Lámá*, who has been conducting certain religious service in an adjoining room, brings the auspicious offerings prepared for the gods to be touched by the married couple. He recites a few benedictory *mantras* in order to bless them, and then touches their heads with the offerings and the *Dahdar*. The bride reverentially receives the tray containing the offerings together with the *Dah-dar* from the hands of the *Tashi-kyi Lámá*, and places them on her lap. The offerings are carefully preserved, being placed on the altar of the household god. In the meantime the guests one by one come forward to present the *Badar*, *i. e.*, the auspicious scarf of marriage each with a rupee in his hand to the bridegroom, bride, and the principal members of the bridal party, headed by the *Pag-pon* the best man, who gets the largest share of presents. On this occasion the *Tashi-kyi Lámá* whose part resembles that of a *Purohit* in a Hindu marriage, is required to make the largest present to the best man. It is therefore commonly said that religious men, *i. e.*, priests and Lámás should not attend a marriage ceremony, they had better be present at a funeral ceremony ("*Lama choipa de tsho pag-ma lan sar-mando mi shi sar-do*") because in a funeral ceremony all the effects of the deceased go to the Lámá, whereas in a marriage ceremony, he has to make considerable presents, instead of receiving any thing in return for his services.

After the presentation of *Badar*, the distribution of uncooked meat, rice *chang*, &c., in the way of remuneration to those who took part in the marriage, takes place. When this is over the grand feast takes place.

The dinner is commenced with the *Don-ñer* saying as follows:—

"According to the common saying of our country on the occasion of birth, and that of giving name to a child, the drinking of wine is the chief entertainment, but in a marriage ceremony drinking alone is not sufficient. It must be supplemented by a feast of more substantial kind than drinking," *i. e.*, a heavy dinner is essential to add to the merriment of a marriage. Then meat and rice are served in large quantities to all those present on the occasion. According to the common usage the largest share of meat is generally given to the best man, next to him the Thapon's claim is taken into consideration, inasmuch as they had taken the largest share of trouble in the marriage.

The last day of *Chang-thung* called the *Changser*, the day of golden

drink, is marked in Sikkim by music and dancing, which is kept up during the whole day. It is indeed a day of merriment and revelry. Bacchanalians are sung each time the party go to refresh themselves with *chang*. It is said that in ancient time the marriage festivities used to be kept up for nine days and nine nights, but in these degenerate times the moral merits of the human race having diminished, the festive period has been reduced to three days. Then at the last stage of revelry when they have drunk to their heart's content, they finish the dance of marriage, each pulling one anothers ears and disperse.

The married couple then retire. One year after the ceremony of *Chang-thung* the bridegroom with his wife visits his father-in-law's home. The ceremony observed on this occasion is called the *Pag-log* (return of the bride to her father's place), when new presents are made to the married couple by the parents of the bride. This completes the marriage ceremonies of the Sikkimese.

III.—*Miscellanea Ethnographica.—Communicated by the* Anthropological Secretary, *from the paper of the late Dr. James Wise.*

CHAPTER I.

The Hindus of Eastern Bengal.

The Hindus of Bengal claim to be pure Aryans, but the Hindus of Upper India repudiate any relationship with them. The Aryan immigration extended gradually throughout Bengal, and the tie which bound the settlers to their faith and peculiar usages was relaxed by residence among aliens. The example of races untrammelled by caste or religious scruples also led them to shake off all bonds and assert greater freedom of action. The priesthood formed illegal connections and neglected their religious duties, while the mixed offspring observed none of the Bráhmanical ordinances. In the tenth century corruption and irreligion being universal, Adisúra introduced priests, trained in the orthodox school of Kanauj, to reform and educate the people. But the arrival of a small body of religious teachers did little towards elevating the Bráhmans, or laity, and in the twelfth century Ballál Sen found only nineteen families of the Ráṛhí Bráhmans living in strict obedience to all that their religion demanded. These families were raised to the highest rank, but those who had forfeited all respect and formed illegal marriages were reduced to secondary, or even lower grades. The innovations made by this monarch only affected the Ráṛhí and Varendra

Śreṇi, or orders, for the Vaidika and Bhaṭ, refusing to be classified by a Vaidyá, retired into the hill countries of Sylhet and Orissa; and the other tribes, who had become hopelessly demoralised, were left untouched.

The chief object of the reform organised by Ballál Sen was the creation of an aristocratic and powerful hierarchy, placed in such a position of dignity, that no misdemeanour and no immorality could deprive it of hereditary privileges, or the reverence of the lower classes. An illegal marriage was the only transgression entailing loss of rank and forfeiture of respect. No provision was made in this new code for the elevation of the lower ranks when families became extinct; consequently, as Kulin houses disappeared, the difficulty of procuring husbands for daughters vastly increased, and when the third reorganisation of the order was made by Deví Vara, in the fourteenth century, polygamy and the buying and selling of wives was the engrossing occupation of the twice-born Bráhmans.

In spite of these successive endeavours for securing the purity of the Bengali Bráhmans, it is remarkable that Kanaujiya, and other Bráhmanical tribes of Hindustan, have always despised and repudiated any connection with their Bengali brethren. In their religious and domestic ceremonies, habits of life, and mode of living, Bengali Bráhmans are quite distinct from any of the other tribes, and the only point of attachment between them is when outcast Kanaujiyas marry Śrotriyá maidens and become absorbed into their ranks. Although clinging with characteristic pertinacity to all the prerogatives of their order, modern ideas are gradually undermining their bulwarks, and the exclusive rules are step by step yielding to education and the progress of the nation. Kulín Bráhmans are now found adorning the bench, the bar, and the medical profession, and, while proving useful members of society, exert a rare influence for good over their Hindu countrymen.

Besides the Ráṛhi and Varendra tribes, there were in Bengal four inferior classes of Bráhmans left out of the organisation of Ballál Sen, namely, the Vaidika, Sapta-śati, Áchárya, and Agradána. The three first claim to have been resident in Bengal before the reign of that monarch, and the services of all the four are still required by the Ráṛhi Śreṇi at many important ceremonies. The Vaidika is the only division that has preserved an honourable position; but whether this is owing to their being descendants of Kanaujiya Bráhmans, to the respectability and decency of their lives, or to their independence of character, is very doubtful. They decline to give their daughters in marriage to the Kulin Bráhmans of Bikarampúr, and refuse to act for any clean Śúdra, or Bráhman, unless his family can trace their origin to Kanauj. The

Sapta-ṣati, undoubtedly one of the oldest Bengali septs, is gradually being absorbed by the Ṣrotriyá, and few confess they belong to it. In a few years they will be sought for in vain. The Áchárya and Agradána are Bráhmans only in name. The former are chiefly employed in secular occupations, and in discharging duties useful, but unknown, to the Vedas or Puráṇas. The Agradána, claiming to rank above Áchárya, is the most despised of the sacred order, and clean Ṣúdras, as well as Patit Bráhmans, would be degraded by eating with them.

The Patit Bráhmans are the most active representatives of the Hindu hierarchy, having fallen from their high estate by neglecting religious duties, officiating in Ṣúdra temples, marrying into inferior grades, or acting as Purohits to the Varṇa Ṣankara.[1] The loss of rank has in some respects been mitigated by the affection and devotion of the laity, and by the high social position given by the caste for which they officiate. It is to this class, abandoned by the Kulins, that India owes the spread of the Hindu religion among the wild tribes of the Taráí, Assam, and Eastern Bengal, and the conversion of the semi-Hinduised aborigines throughout Bengal. Bad and immoral many of these Ṣúdra Bráhmans are, but as a class their lives are not one long course of depravity and selfish indulgence, as is too often the case with the Kulins. Education has made no progress among them, and holding the position they do, concession to the wants of the age is not to be expected. Their hold over the men is slowly loosening, but the women still obey and worship them, and while this subjection lasts Hindu caste and Hindu exclusiveness will remain.

Though not recognised in books, many social grades are found among these fallen Bráhmans. Those ministering to the Nava-ṣákha,[2] popularly called Ṣúdra Bráhmans, occupy a position of comparative distinction; but at the bottom of the scale Bráhmans appear, who are accounted lower than the vile caste they serve; while such an individual as the Chaṇḍal, or Ḍôm Bráhman scarcely deserves to be called by that proud title.

The Vaiṣya caste, standing next the sacred order, occupies a very anomalous and strange position. Their claim to be genuine Vaiṣyas is admitted by the higher classes, but the Ballálí Vaidya and Káyath refuse to touch food prepared by them. This small caste deny that Ballál Sen reorganised or interfered in any way with their regulations, and for this reason it remains isolated and unrecognised by Hindus.

The two next castes are the Vaidya and Káyath, who repudiate the name of Ṣúdra, and maintain that Ballál Sen did not enroll them

1 Literally mixture of colours: hence mixture of castes.

2 Or Nava-Ṣayáka, the nine inferior castes.

among the "Nava-Ṣákha." Both are satisfied to rest their title of superiority on the fabulous births of their reputed ancestors. Ballál Sen belonged to the Vaidya caste, and it is to his partiality that it secured pre-eminence. On one section the Bráhmanical cord was bestowed, although the caste profession was a dishonourable one, and Ghaṭaks were engaged to preserve the family purity. There has always existed much latent jealousy between the Vaidya and Káyath, but the latter acknowledge some inferiority, although the cause of this difference is never defined.

The Káyath is undoubtedly one of the oldest tribes in Bengal, but it is unnecessary to believe all that is said of Ádisúra and the five servants of the five Kanaujiya Bráhmans. One branch, the Bangaja,[1] has been settled for many generations at Edilpúr, along with the caste Ghaṭaks, and Kulin Káyath families are as punctilious and as vain of their birth as any Gánguli, or Mukharji, although the Lálás of Mathurá and Agra laugh at such pretensions, and will not recognise them as Káyaths at all.

The Kevala, or pure Ṣúdra, does not exist in Bengal. All castes below the Bráhman belong to the "Varṇa Ṣankara," being the offspring of parents of different tribes.

The recognised authorities on castes are the Institutes of Manu, the Játi Nirṇaya chapter of the Brahma-Vaivartta Puráṇa,[2] and the Játimálá. According to the Bráhmans it was the wickedness of Veṇa, the Rájarshi, who ordered that no worship should be performed, no oblations offered, and no gifts bestowed on Brahmans, and caused the people to disobey the laws and intermarry with prohibited classes. Until his era Bráhmans only married Bráhmans, Ṣúdras, women of their own rank, and Chaṇḍálas followed their own tribal customs. It was natural for the priests to attribute the irreligious propensities of the people to a cause like this; but there is no doubt that laws prescribed by the Bráhmans for maintaining the purity of their order must have been soon violated by those in whose favour they were enacted. Although marriages between individuals of different tribes gave origin to the Varṇa-Ṣankara, or mixed castes, the Puráṇas give other explanations. According to the Bráhma-Vaivartta Puráṇa, the gardener, blacksmith, shell-cutter, weaver, potter, and brasier are descended from the offspring of Viṣvakarma, the celestial architect, and Ghṛitáchi, an Apsará, or nymph of heaven, and hence it is that all Kárus, or artisans, worship their progenitor with exceptional reverence. The reasons, again, why certain

[1] Banga, or Vanga-ja, Bengali born.

[2] A synopsis of this is given in the *Calcutta Review*, vol. xv, p. 60.

castes are degraded are often quite ludicrous, but this does not cause their rejection. The Sútradhára lost rank for refusing to supply the Bráhman with sacrificial wood; the Chitrakára for painting execrably; and the Suvarṇakára for stealing gold given him to mould an idol. The modern Súnṛí moreover, does not resent being told that his ancestor was created from the chips of the mutilated trunk of Ganeṣa, nor the Kumár that Ṣiv transformed a waterpot into the first potter.

According to the classification of Ballál Sen, as interpreted in Eastern Bengal, the nine following castes are considered pure, and the so-called Ṣúdra Bráhman officiates for all :—

Ṣánkhárí.	Kumár.	Gop-Goála.
Tántí.	Málakár.	Madhu Nápit.
Kámar.	Nápit.	Baráí.

Judging, however, by traditions still surviving, the position of a caste in the new roll depended chiefly on its usefulness and importance to the community at large. The profession which had proved itself essential to the comfort or welfare of the Hindu hierarchy was at once promoted to a higher level, while the less important was reduced. Thus the Tántí, unclean in Bihár, became clean in Dacca, and the indispensable barber was raised to the same social level as the Káyasth. The relative position of the various castes is still a burning question in Bengal, and in large villages where any caste predominates, its claims to superior rank are usually conceded. For instance, the Gandha-banik, Telí, Támbúlí, and Káṉsárí often assert to good purpose the right of being enrolled among the nine, and if their voice be sufficiently loud and influential it will be heard.

The Nava-Ṣákha have five servants, or Pancha-vartta, attached to them in common, who possess the prescriptive right of attending at all caste and family celebrations. The five servants are the Brahman, Málákár, Dhobá, Nápit, and Naṭa, or musician, who are presumed to be exclusively engaged in the service of the Ṣúdras, but they also earn money by waiting on lower castes. Even now-a-days some work for the Súrya-vaṉsi, who ten years ago were not Hindus in name, while others readily work for the Báotí, Kapálí, Kawálí, Paráṣara Dás, and other tribes of doubtful origin. Where the fisher castes are numerous and cannot be overlooked, no difficulty is found in engaging their services. They work indeed for all castes employing a Patit Bráhman, but the utterly vile tribes, the Bhúinmálí, Chamár, Paṭní, and Súnṛí, having Bráhmans of their own, are not served by the Pancha-vartta. To this general rule, however, there are exceptions. The worshipful barber, for instance, condescends to shave, but will not pare the nails of the rice Sáha merchant.

Although caste is no longer revered as an old institution sanctified by religion and immemorial usage, and is disappearing before the assaults of modern civilisation, a tendency to the formation of new castes still exists. Semi-Hinduised races are being enrolled among Hindus, and old established castes are being split up by adopting new occupations. But if this new occupation be not dishonouring, the Purohit continues his ministration. For instance, the great Chandal tribe has given off eight branches, yet the Chandal Bráhmans officiate for all. On the other hand, the agriculture Kaibarttas, having taken to a base employment, are obliged to support a Purohit of their own.

Between the Śúdras and the Nícha, or vile castes, many tribes, organised by degraded Bráhmans, or united by the exigencies of modern civilisation, are found occupying an uncertain position, exposed to the sneers of the exclusive and conservative Śúdras.

These intermediate castes are—

Báoti.	Kándho.	Lohait Korí.
Baqqál.	Kapálí.	Nar.
Bhát.	Karní.	Paráśara Dás.
Beṛua.	Karrál	Pátial.
Halwah Dás.	Kawálí.	Sutár.

In the Tantras,[1] the epithet Antya-ja, or inferior, is applied to the following seven tribes :—washerman, currier, mimic (Nata), fisherman, "Meda," or attendant on women, cane-splitter (Varnda), and mountaineer (Bhilla). The term Antyávasáyin, or dwellers outside the town, was given to the Dôm, Pan, Háṛí, and other sweeper castes.

We, however, possess a very correct list[2] of the outcaste tribes in Bengal in the roll of pilgrims excluded from the temple of Jagannáth. If prohibited castes are distinguished from professions there are only eleven castes so utterly disreputable that they dare not enter the sanctuary. These are the—

Súṇṛí.	Kahár.	Tíyar.
Nama-Śúdra.	Ráj-Vaṇsi.	Bhúinmálí.
Dhobá.	Chamár.	Háṛí.
Jogí.	Dôm.	

Much information regarding caste, understood in Bengal, is obtained by comparing the relative position of Hindustánís who reside, or temporarily sojourn there, with that of castes native to the province.

Permanent residence is always attended by social expulsion, but a stay of a few years is with some castes a disqualification, with others it

[1] Colebrooke's *Essays*, ii, 164.

[2] Harington's *Analysis*, iii, 213; **Hunter's** *Orissa*, i, 136.

is not so. For example, the Ahír, Surahiyá, and Kanaujiyá Bráhmans, who keep up communication with their kindred and marry from their own homes, are reckoned pure; but the Kahár, Ahír, and Kándú domiciled in Bengal forfeit all claim to be considered stainless. By adopting local Ṣúdra customs and marrying with women of the country Hindustáni tribes are stigmatized as "Khonṭá," or debased. The Kanaujiyá Bráhman, again, expelled by his family for these delinquencies, finds shelter in the ranks of the Srotriyá; but above this he cannot expect to rise, and his children must be content with a very ambiguous position.

The steps by which a Hindustáni caste loses its original rank and gains a new one may be traced in the case of the potters. The Kumhár of Bihár is always unclean in Bengal, but if he marries a kinswoman he may return to his home without loss of rank. The Ráj-Mahállia potters however, being in an intermediate state, have neither risen to an equality with the Bengali Kumár, nor remained unclean like the Kumhár. The Ṣúdras of Bengal drink from their water-vessels, and, still more blessed, the Ṣúdra Bráhman ministers unto them. Lastly, the Bengali Kumár, originally of the same stock, has become in the course of ages a pure Ṣúdra and one of the Nava-Ṣákha.

In no instance, however, is the separation between kindred castes so striking as with the Chamárs and Rishís. Both belong to the same tribe, both are equally vile in the eyes of Hindus, and both live apart from all other castes, yet similar occupations not only excite jealousy and enmity, but prevent all friendly intercourse between them.

Occupations, moreover, which a Hindustáni may engage in at home without stain or obloquy, are sometimes unbecoming when the habitation is in Bengal. Thus the Dômni and Chamáín, professional musicians in Upper India, are disgraced by plying for hire in Bengal, while on the other hand such menial work as the Mungírya Tántís perform in Dacca would be considered very debasing in their own district.

Although continuous residence at a distance usually repels, a brief sojourn sometimes draws together, disunited subdivisions. Thus the different branches of Ahírs and Chhatrís intermarry in Bengal and lose caste, although debarred from doing so in Hindustan.

The Bráhmanical order to which the Purohit belongs is generally a nice test of the rank accorded to a Hindustáni caste. Among the lower tribes the Guru belongs either to one of the Daṣnámi orders, or he is a Vaishnava Bhagat, who visits his flock at regular intervals, confirming the old, and teaching the young the rudiments of their faith. Maithila Bráhmans, on the other hand, ordinarily act as Purohits to Kurmí, Chhatrí, Kándú, Ahír, Cháín, and Kewaṭ; but Chhatrís are occasionally found with a Sarsut, or Sarasvatí, Bráhman, and Kurmís

and Dosádhs with a Ṣákadvípa. The Kanaujiya tribe again ministers to Binds, Tántís, and Gádaṛiyás. In the case of the Raṇḍa Khatrís, whose parentage is equivocal, the strange phase is found of a Kanaujiya acting as Purohit, a Ṣrotriya of Bengal as Guru.

A most important distinction between Hindustání and Bengali castes of similar origin, is the religious belief found among them. It may be said with perfect truth that Vaishnavism, in one or other of its diverse forms, to the exclusion of Ṣaivaism and all other creeds, is the faith professed by the agricultural, artizan, and fisher tribes of Bengal. The worship of Kṛishna has for obvious reasons attracted well nigh all the Goála and other pastoral tribes of India. The teaching of Chaitanya and his successors has made little progress among Hindustání castes, but the sympathetic creeds of Kabír and Nának Sháh have attracted multitudes of disciples. The Kurmís and Dosádhs especially patronise Kabír; the Kewaṭs, Kumhárs, and many Dosádhs enroll themselves under the banner of Nának.

It is among castes from Northern Bengal, such as the Kándú, Bind, Muriárí, and Surahiyá, that the followers of the strange Pánch Píriya creed are to be met with. Other curious sects, unknown to Bengal, are also found in their ranks. The Tirhutiyá Tántís are members of the Buddh Rám communion. Kurmís often profess the doctrines taught by Darya Dás, and many Dosádhs those of Tulasí Dás. Still more worthy of notice is the existence among them of an old prehistoric cultus. The apotheosis of robber chiefs by Dosádhs, the deification of evil spirits, as Rahu by the Dosádhs, Kasi Baba by Binds, and Madhu Kunwár by Tántís, and the animistic idea, endowing with life and personality the destructive energy of the Ganges, are all forms of belief unknown to castes native to Bengal.

IV.—*Jauharí.*—*By* the late Dr. James Wise.

Dealers in precious stones are found among both Muhammadans and Hindus, but the more eager purchasers are, as a rule, persons of the former creed. Many shopkeepers sell gems, but the Jauharí can alone distinguish the real from the spurious.

"'Ilm-al-jawáhir" is considered a distinct branch of oriental science, dealing with the qualities of gems, the art of distinguishing good from bad stones, and the knowledge of the virtues inherent in each.

According to oriental authorities, the most precious gems are nine in number,[1] each representing a planet. Black is ascribed to Saturn, green to Jupiter, red to Mars, yellow to the sun, and white to the moon. The colour of a gem depends either on the matrix in which it is found embedded, or on the direct influence of its particular planet. Transparent stones are supposed to be formed from drops of rain; opaque ones from water and earth, acted on by the sun and the internal heat of the mine (Harárat-i-ma'dan.)

The "Nava-ratna," or nine gems, are the following:—

1. *Maṇika, Yáqút, Lál.*

The Ruby is regarded as the king of stones, and though found in Ceylon and Badakhshán, is said to be only genuine in Burmah. A large one exceeding six ratís in weight is of priceless value; but should the slightest opacity, or flaw, be present, it is considered unlucky to wear it. A ruby, moreover, is believed to be a preservative against certain diseases and a safeguard against lightning.

The ruby mines of Badakhshán, which supplied the "rubis balais" of the French, have been closed for many years.

2. *Muktá, Motí.*

Two varieties of pearls are distinguished, the Ceylon and Basra. According to oriental poets they are drops of vernal rain congealed in oyster shells, and by the same fanciful conceit the origin of amber is ascribed to the tears of "sorrowing sea birds." Pearls found in the fresh water rivers of Bengal by the Bediyás being of little value, are chiefly used in medicine. Tavernier mentions that at the court of Sháh Jahán no person of quality ever appeared in public without wearing earrings having a pearl set between two coloured stones.

3. *Híra, Vajra, Almás.*

Four varieties of diamonds are known in India—the white, red (lál, or gulábí), yellow, and green, which, in accordance with the fanciful nomenclature in fashion, are distinguished as Bráhman, Kshatriyá, Vaisya, and Súdra. The price of diamonds is estimated by their weight and cutting. The English brilliant is most valued, then the Dutch, Benares, "Takícha," and "Purab," or Eastern cutting, the two latter being ground according to the rough and faulty fashion peculiar to India. The value of a stone in Native ideas is enhanced by being large and

[1] The Vaijayanti, or necklace of Vishnu, is only set with five, namely, pearl, ruby, emerald, sapphire, and diamond.—*Vishnu Puraná*, p. 158.

heavy, and the workmen think more of leaving the stone big than of unveiling its hidden beauties. A variety, from its hardness called "Kaṛá," is spoken of as being so dark that no amount of polishing will brighten it. This is probably the "Carbonado," so much employed in boring rocks. Indian connoisseurs depreciate Cape diamonds as being dull and yellowish. A diamond with a pink or dark streak is considered by the natives of Hindustan as most unlucky.

4. *Marakata, Harin-maṇi, Zummurud, Panná.*

The emerald is a very favourite stone with Muhammadans, being used to ornament sword hilts, scabbards, and gold cups. Travernier[1] asserts that it was unknown in India before the conquest of Peru in 1532; but he is undoubtedly wrong. In 1515, Andrea Corsali[2] says, emeralds were in greater estimation in India that any other stone; Garcia de Orta,[3] in 1563, mentions that Peruvian emeralds were then branded as spurious; and De Boot,[4] in 1609, writes that during the previous fifty years oriental emeralds had fallen in value, owing to the importation of specimens from the New World, but that the Oriental were really better and more perfect stones. Baldaeus,[5] in the seventeenth century, describes three kinds of emeralds in India—the Scythian, Egyptian, and Peruvian, the first being most valued. Finally, Streeter[6] describes the Indian emerald as of quite a different quality from those found in South America. Where the oriental emerald came from was unknown to De Orta and De Boot; but of late years the emerald mines of Egypt, mentioned by Pliny, have been described by M. Cailliaud.

The popular belief in Hindustan is that the finest emeralds formed part of a cargo of a vessel wrecked on the west coast of India, belonging to Alexander the Great.

Many virtues have been attributed to the emerald. Greeks and Arabs believed it to be an infallible preservative of chastity, and to facilitate parturition. A dark coloured stone without flaws is, by Al Ṣuyúṭí, and oriental nations generally, considered a safeguard against snake-bites, and, being a surety against epilepsy, is recommended to be worn by the children of noble families. An emerald reduced to powder, and given in a draught, cures leprosy.

1 II, c. xvi.
2 *Ramusio*, i, 180.
3 *Aromatum et simplicium, &c.*, edition 1567, p. 199.
4 *Gemmarum et lapidum historia*, p. 101.
5 *Churchill's Voyages*, iii, 656.
6 *Precious Stones and Gems*, p. 151.

5. *Indra-níla, Nílam, Nílmaṇi, Cafir.*

The sapphire comes either from Burmah or Ceylon. In Europe it has always been considered to prevent evil and impure desires; in the East the owner, it is believed, will never become poor, but if it exhibits the slightest flaw he will certainly die suddenly.

6. *Go-meda, Go-medaka.*

This is described as a red stone with a yellowish tinge, and is either an agate or a topaz.

7. *Lahsaniy, Chashmdár, 'Ain-ul-hirr.*

Indian jewellers distinguish three sorts of cat's eye,—one with a yellow, a second with a pale green, and a third with a dark shade or streak. Should the gem possess one or more lines of lustre it becomes priceless, being venerated as a sacred stone. On approaching buried treasure the owner will find the stone leave its setting, and as long as he retains it his wealth will never diminish. It is a preservative against many diseases and all forms of witchcraft. De Orta and Baldaeus preserve a superstition current in their day, to the effect that cloth rubbed with a cat's eye is rendered fireproof. The former believes in its truth, but the latter says, "I have found this contrary to truth by my own experience."

8. *Prabála, Munga, Marjan.*

In India red coral is included among gems, being made into beads for necklaces, and into charms for armlets. Tavernier states that coral was used in the seventeenth century "by the meaner sort of people all over Asia, more especially by the hillmen of Assam and Bhutan, for bracelets and necklaces." At the present day it is given by Hakíms along with pearl powder to cure impotency, and by itself to correct bilious disorders.

9. *Pitáṣman, Pukhráj, Topaz.*

The topaz was more valued in Europe in former days than it is now; but in the East it has always been a favourite gem, being regarded by Muhammadans as the luckiest of stones. Muhammad is said to have worn one in a ring, which passed to his successors and ensured prosperity. The Khalífa Othman let it fall into a well, and this loss is believed to account for the tumults during his rule, and for his violent death. Confiding in the good fortune conferred by the stone, Aurangzíb always wore one on State occasions, and Tavernier alludes to a topaz in his treasury which cost 18,000 pounds sterling.

These are the nine gems of the Hindus, but many other precious stones, being valued, are invested with preternatural virtues.

The Fírozah, or turquoise, although cheap and common, is more frequently worn by Muhammadans than any other gem. The finest "Basháqí" come from Níshapúr in Khurásán, and Karman. If received as a gift the turquoise is believed to avert the evil eye, to be an antidote against poisons, to grow dim when the well-being of the giver is in danger, and to cure the stings of scorpions, as well as the bites of noxious animals. Another peculiarity attributed to it is that of becoming hazy when the sky is lowering or overcast.

Vaidurya, Lájaward, or lapis lazuli, is often substituted as one of the nine gems in place of the cat's eye. Mines of this stone still exist in Badakshán, but being lightly valued it is rarely seen in Bengal.

Jade, known in Persia as Sang-i-yashm, but more generally throughout the East by its Turki name, "Kash," is not so much admired in Hindustan as in China and the Himálayas.

In India the grey, white, dark green, and red varieties are occasionally seen. The dark green was formerly most admired, and several drinking-cups belonging to Jáhángír are made of it. The different sorts are employed for ornamenting scabbards and the frames of mirrors. Trays, plaques, dagger, and "chaunri" handles are often made of this mineral. When bows and arrows were in fashion, the ring worn to protect the thumb was generally formed of jade. Many superstitious virtues are attributed to jade in India, and no zanánah in Eastern Bengal is without a piece. Cups made of it are said to fly in pieces when poison is poured into them; a fragment is believed to protect the wearer against lightning; and when licked it allays palpitations of the heart. Jade is brought from the mines on the banks of the Karakash river in Khoten and Yarkand, which were visited by Goez in 1604, and by Shaw in 1868. The fragments found in the river are three times the price of the quarried stone, which is injured by the fire used to splinter it. From Yarkand it is chiefly exported to China, and never reaches India in the raw state.[1]

Many of the poorer Muhammadans in Bengal wear either a carnelian ('aqíq), or an agate[2] (Sulaimání) ring, but a few fancy the moss agate, or Mocha stone ('aqíq ul-bahr).

The carnelian is said to possess three properties: it calms a person

[1] Regarding jade, more information is to be found in *Astley's Voyages*, iv, 645; *Moorcroft's Travels*, i, 375; Jule's *Cathay*, i, 130; ii, 564; and Shaw's *Visit to High Tartary*, p. 474,

[2] Áisha always wore an agate necklace.

excited by fear or passion; it stops hæmorrahage, especially in females; and it cures bleeding from the gums, or scurvy. Al Tífáshí distinguishes five kinds—red, flesh-coured (raṭbi), blue, black, and white.

Amber, much admired in parts of India, is not valued in Dacca, but its electrical properties early attracted attention, and both its Sanskrit name, "Tṛiṇa-gráhin," and its Persian, "Kahrubá," signify "straw drawing."

Amber is found on the eastern frontier along with lignite. Mines exist at Meinkhoon, north-east of Manípúr, and the fossil finds a ready sale among the Singphos and Chinese.[1]

Many oriental works on gems have been written, which are still popular in the East, and at least two have been translated into European languages. The work of Ahmad ibn Yúsuf ibn Muhammad Al-Tífáshí (d. 1253), called "Azhár al-Afkár," was partially done into Latin by Sebald Rau in 1784, and into Italian by Antonio Raineri in 1818. A treatise by the famous Al-Suyúṭí (d. 1505) was translated by the Maronite, Abraham Ecchellensis, in 1647. An abstract of Al Kazwínís' (d. 1275) celebrated "Ajáíb al-Makhluqát," or Wonders of Creation, has also been published.[2]

V.—*Measurements of Cingalese Moormen and Tamils taken at Ceylon in November* 1892.—*By the* Hon'ble H. H. Risley, C. I. E.

The following measurements of the three most numerous and characteristics races of Ceylon were taken in accordance with my instructions, and under my supervision, by Civil Hospital Assistant Babu Kumud Behari Samanta, whom the Asiatic Society deputed to accompany me for this purpose on a recent tour in Ceylon. The instruments used were those recommended by Dr. Paul Topinard; the methods followed and the measurements adopted were based upon his work *Les Elements d' Anthropologie Générale*, and upon personal advice from him and Professor Flower of the British Museum. In a later number of the Journal I shall attempt to give some account of the races in question, and to indicate briefly the conclusions which the measurements seem to suggest.

1 *Journals of Travels.* By William Griffith, i, 77.

2 *J. A. S. of Bengal*, xiii, 632.

Measurements of 56 Tamils

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial numbers.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
1	Sevanan ...	Parayan	...	...	Tinnevalley ... S. India.	30	830	1620	1577	830	1165	1242	105	179	139	77·6
2	Mutenchati	Wellale	...	...	do.	30	760	1740	1700	892	1267	1260	114	186	146	78·4
3	Podisen ...	Parayan	...	...	Trichinopoly S. India.	30	780	1590	1540	802	1140	1150	...	180	141	77·3
4	Paranti ...	do.	...	...	Dekoya ... Ceylon.	25	860	1754	1620	840	1210	1220	...	191	140	73·2
5	Palanu ...	do.	..	...	Tondaman ... S. India.	35	810	1740	1650	810	1228	1240	...	190	144	75·7
6	Pachiá ...	do.	...	...	Karangola Cote, S. India.	40	845	1778	1624	826	1178	1184	118	188	146	77·6
7	Punusami ...	do.	...	...	Warderkebil S. India.	27	835	1702	1594	824	1180	1196	111	187	146	78 0
8	Punusami ...	Agamboty	...	...	Madura ... S. India.	30	805	1676	1620	800	1200	1226	111	181	143	79·0
9	Handi ..	do.	...	...	do.	35	840	1834	1706	840	1220	1292	119	181	144	79·5
10	Chulan ...	Parayan	...	...	Puthucota ... S. India.	32	820	1765	1648	822	1204	1224	109	184	148	80·4
11	Armogom ...	Belálas...	...	...	Trichinopoly S. India.	40	810	1620	1524	842	1158	1194	107	187	139	74·2
12	Marugar ...	Parayan	...	...	Arkadu ... S. India.	28	830	1650	1560	770	1140	1191	103	191	139	72·7
13	Kulan ...	Sakilian	...	...	Alanedu ... S. India.	34	875	1834	1686	830	1228	1282	124	191	147	76·9
14	Kolanda ...	Edian ...	...	...	Maradachila S. India.	30	795	1624	1614	820	1200	1194	102	180	148	82·2
15	Kandrewal ...	Parayan	...	...	Trichinopoly S. India.	26	845	1774	1634	774	1186	1222	106	191	141	73·8
16	Peran ...	Perlén ...	...	...	Putekudu ... S. India.	30	850	1776	1660	802	1212	1274	111	186	149	80·1
17	Luchman ...	do.	...	...	Trinevally ... S. India.	30	850	1720	1600	812	1174	1194	112	184	137	74·4
18	Fanini ...	Kalen ...	...	...	Onecote ... S. India.	25	810	1666	1546	776	1172	1164	95	181	145	80·1
19	Kalienti ...	Tamilta	...	...	Madras ... S. India.	40	830	1700	1626	834	1194	1210	110	184	144	78·2
20	Mutai ...	Sadia ...	...	...	Katpali ... S. India.	38	845	1782	1618	816	1186	1214	109	178	136	76·4
21	Kopendi ...	Palal ...	...	...	Chaigange ... S. India	30	835	1660	1532	756	1116	1146	98	176	138	78·4
22	Chowal ...	Pellé ...	...	...	Alangcote ... S. India.	30	815	1664	1588	774	1152	1196	94	173	147	84 9
23	Pararhé ...	Kalla ...	...	...	Konapati ... S. India.	25	835	1660	1600	810	1194	1210	106	189	142	75·1
24	Kisna Swami	Pellé ...	...	...	Taujore ... S. India.	40	860	1672	1602	802	1186	1240	...	181	143	79·0
25	Sewsa Swami	Naran ...	...	...	Trichinopoly S. India.	25	880	1846	1700	846	1266	1280	...	190	139	73·1
26	Jaka ...	do. ...	...	...	Trinevally ... S. India.	35	860	1714	1570	798	1168	1172	...	190	134	70·5
27	Antom ...	do. ...	...	...	do.	40	845	1 708	1668	872	1234	1238	...	192	164	85·4
28	Mute Swami	Pellé ...	...	...	Chowranda ... S. India.	35	845	1738	1690	858	1218	1258	112	189	150	79·3
29	Manike ..	Konar ...	...	..	Palechari ... S India.	38	810	1668	1604	806	1168	1200	103	181	143	79·0

taken in Ceylon in November 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxilliary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxilliary-zygomatic index	Nasal height.	Nasal width.	Nasal index	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersupercilliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
100	136	73·5	47	38	80·8	113	124	112·3	91	133	215	65	436	245	105	282	382
100	131	76·3	44	37	84·0	109	124	113·7	101	130	230	67	467	254	108	283	400
95	127	74·8	45	36	80·0	93	106	113·9	89	132	208	65	43·6	254	113	378	422
101	127	79·6	49	40	83·3	107	126	117·7	96	130	218	65	460	247	120	260	402
107	138	77·5	46	38	82·6	102	116	113·7	90	135	214	66	457	257	105	268	376
110	136	80·6	48	38	79·1	98	112	114·2	95	133	216	67	477	247	114	257	386
98	137	71·5	47	35	74·4	101	114	112·8	90	135	225	60	446	231	103	257	397
101	126	80·1	44	44	100	94	102	106·3	100	136	228	58	447	234	112	257	385
101	135	74·8	48	40	83·3	106	114	107·5	100	131	230	68	483	263	119	271	425
101	131	77·0	46	40	86·9	97	116	119·5	94	131	220	66	457	243	117	276	397
96	127	75·5	45	37	82·2	92	106	115·2	92	128	221	67	454	256	112	283	378
100	129	77·5	47	42	89·3	102	114	111·7	92	136	226	62	445	242	107	254	364
111	133	83·4	44	38	86·3	104	118	113·4	100	140	222	68	482	255	115	267	412
101	125	80·8	48	41	85·4	94	106	112·7	95	140	216	62	444	247	113	271	378
101	132	76 5	43	38	88·3	107	120	112·1	87	120	211	70	494	253	116	258	377
102	131	77·8	44	39	88·6	101	114	112·8	96	129	216	66	471	245	116	262	387
95	128	74·2	42	38	90·4	97	108	111·3	99	139	219	70	467	238	107	271	412
99	127	77·9	44	38	86·3	92	102	110·8	96	135	225	63	431	222	97	224	377
104	138	75·3	45	37	82·2	99	110	111·1	99	137	225	65	473	216	109	263	382
92	128	71·8	46	40	68·9	95	108	113·6	82	130	215	62	477	248	112	252	370
94	121	77·6	45	36	80·0	95	102	107·3	87	129	218	68	453	222	110	255	390
96	128	75·0	44	36	81·8	97	108	111·3	90	137	209	68	465	250	110	250	374
101	130	77·3	45	41	91·1	95	106	111·5	85	135	212	70	468	242	111	245	378
105	131	80·1	48	41	85·4	97	114	117·5	82	130	213	68	45·5	244	106	290	393
100	127	78·7	39	37	94·8	95	104	109 4	92	128	213	68	495	258	118	258	411
106	131	80·9	45	40	88·8	94	108	114·8	95	122	213	69	448	248	117	246	409
97	139	69·7	53	45	81·1	101	112	110·8	93	146	227	72	473	256	112	278	396
106	124	85·4	43	42	97·6	95	104	109·4	97	129	212	69	470	225	114	268	380
99	133	74·4	44	41	93·1	93	104	111·8	95	134	205	69	457	248	111	225	377

Measurements of 56 Tamils

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial number.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
30	Beronuter ...	Parachadi	...	...	Peremboor ... S. India.	30	820	1688	1596	808	1176	1176	103	183	138	75·4
31	Kamde Swami	Hagambadi.	...	...	Parencoti ... S. India.	38	862	1684	1628	836	1188	1188	113	188	152	80·8
32	Ramaswami	Agampota	...	...	Madura ... S. India	30	840	1666	1610	850	1176	1208	119	196	150	76·5
33	Tanti ...	do.	...	...	Madacheure S. India.	30	865	1800	1736	838	1270	1292	131	186	150	80·6
34	Mutoke ...	Ballálé	...	...	Puducote ... S. India.	30	870	1670	1372	802	1162	1152	121	188	147	78·1
35	Alege ...	Saikléal	...	...	Morde ... S. India.	40	720	1520	1502	744	1100	1136	92	179	139	77·6
36	Arlande ...	Parayan	...	...	Puducota ... S. India.	30	825	1732	1662	814	1226	1244	107	188	132	79·7
37	Rumandi ...	Kallem	...	...	Tanakamkelan S. India.	25	845	1674	1662	820	1212	1267	107	186	135	72·5
38	Mutsen ...	Naike ...	...	...	Palini ... S. India.	25	780	1694	1626	812	1192	1220	106	176	147	83·5
39	Chelle ...	Parayan	...	...	Ton dapoti ... S. India.	40	740	1486	1500	750	1100	1152	100	179	185	75·4
40	Ochmali ...	Balu ...	...	...	Palancota ... S. India.	30	795	1668	1630	824	1194	1192	...	184	137	74·4
41	Ispodinada ...	Sanan ...	...	...	Bagbandi ... S. India.	30	820	1676	1644	760	1142	1142	...	190	132	64·9
42	Kapan ...	Pallan ...	...	...	Purtur ... S. India.	40	765	1538	1540	798	1150	1142	...	180	138	76·6
43	Towasi ...	Parayan	...	...	Palancota ... S India.	35	820	1690	1612	798	1194	1198	...	191	143	74·8
44	Marian ...	do.	...	...	Trinevally ... S. India.	26	780	1700	1670	838	1238	1224	...	180	150	83·3
45	Ram Swami	Marapole	...	...	Wadakongco-long S. India.	26	785	1668	1628	822	1182	1210	...	187	145	77·5
46	Sanial ...	Nara ..	...	...	Naganari ... S India.	28	790	1676	1604	834	1200	1206	...	176	140	79·5
47	Narmalinga	Bellálé ...	...	...	Colombo ... Ceylon.	26	770	1694	1676	818	1226	1254	...	180	145	78·3
48	Sonagalilnm	Parayan	...	...	Trinevally ... S. India.	30	830	1670	1612	824	1178	1198	...	182	145	79·6
49	Ored ...	do.	...	...	do.	30	855	1768	1718	870	1248	1262	...	186	142	76·3
50	Sangleli ...	Sakli ...	...	...	Ravanagar ... Ceylon.	40	850	1874	1703	850	1236	1260	...	190	146	76·8
51	Ram Swami	Parayan	...	...	Palamcota ... S. India.	30	800	1700	1664	852	1252	1254	...	191	146	76·4
52	Sepan ...	Edayan	...	...	Trinevally ... S. India.	28	750	1551	1520	760	1112	1136	...	165	137	83·0
53	Kumar Swami	Bellalé	...	...	do.	28	800	1730	1640	830	1212	1210	...	185	153	82·7
54	Enapares ...	Nara ...	...	...	do.	35	830	1640	1620	846	1190	1192	...	182	141	77·4
55	Narain ...	Bellalé ...	...	...	Tanjore ... S. India.	30	750	1588	1560	788	1158	1158	...	181	146	80·6
56	Ram Swami	Rata ...	...	..	Trinevally ... S. India.	45	845	1870	1800	854	1290	1135	...	180	150	83·3
					Average ...		821·2	1696·2	1666·7	816·5	1191·9	1209·3	108·6	184·2	143·2	77·7

taken in Ceylon in November 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxillary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxillary-zygomatic index.	Nasal height.	Nasal width.	Nasal index.	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersupercilliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
91	127	71·6	45	36	80·0	94	106	112·7	89	130	212	64	463	250	110	267	394
105	136	77·2	45	44	97·7	99	110	111·1	91	136	220	67	462	255	113	267	390
110	134	82·0	46	40	86·9	100	108	108·0	90	134	220	69	456	252	114	272	374
116	141	82·2	47	42	89·3	101	112	110 8	103	142	235	67	505	263	127	278	401
108	135	80·5	49	38	77·5	103	112	108·7	96	125	229	60	462	244	111	274	378
96	123	78·0	43	39	90·6	92	108	117·3	90	124	206	67	426	223	100	226	338
111	131	84·7	47	36	76·5	91	100	109·8	100	138	221	68	462	246	116	257	383
96	125	76·0	45	38	84·4	98	108	110·2	102	129	222	61	442	241	103	242	406
105	127	82 6	42	35	83·3	99	108	109·0	97	134	210	65	460	247	112	250	362
95	121	77·8	41	38	92·6	97	106	109·2	86	124	198	65	412	242	105	252	342
101	131	77·0	43	43	100	94	104	110·6	85	125	225	65	471	249	114	261	379
106	129	82·1	47	36	76·5	96	106	110·3	80	136	211	73	457	239	109	258	382
87	121	71·9	41	42	102·4	97	106	109·2	90	123	208	64	443	236	112	256	363
107	135	79 3	48	41	85·4	95	106	111·5	94	120	218	68	370	257	113	249	389
96	131	73·2	48	38	79·1	98	108	110·2	88	130	218	63	462	248	108	261	387
100	131	76·6	42	37	88·0	96	106	110·4	84	127	207	67	455	245	106	259	368
94	123	76 4	45	41	91·1	90	98	108·8	80	126	209	66	454	241	117	232	381
102	132	77·2	49	37	75·5	101	108	106·9	91	120	212	66	468	250	114	243	349
98	130	75 3	45	40	88·8	96	106	110·4	92	129	215	70	465	243	112	250	404
107	130	82·3	49	37	75·5	97	104	107·2	85	135	226	66	498	262	116	279	408
111	135	82·2	53	44	83·0	105	116	110·4	90	130	233	69	505	267	112	275	403
104	131	79·3	50	34	68·0	94	110	116·9	100	147	217	57	470	250	118	255	374
88	123	71·5	44	40	90·9	85	100	117·6	94	134	210	63	428	226	101	224	346
100	132	75·7	48	38	79·1	97	106	109·2	84	140	218	68	469	223	105	238	392
99	131	75·5	50	35	70·0	98	112	114·2	87	134	223	65	451	246	111	258	8
97	125	77·6	49	38	77·5	93	100	107·5	87	121	213	63	437	229	105	240	369
109	133	81·9	51	36	70·5	99	100	111·1	100	120	231	62	518	279	115	260	407
101·0	128·3	78·7	45·9	38·5	83·8	97·6	108 8	111·4	92·0	131·4	217·5	65·9	459·9	245·9	110·4	260·6	385·2

Measurements of 22 Moormen

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial number.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
1	Aboobaker ... Sultan.	Moor ...	...	...	Colombo ...	35	870	1750	1660	864	1232	1216	...	191	148	77·4
2	Miski ...	do.	...	...	do	27	850	1726	1640	824	1202	1214	...	177	131	74·0
3	Mooralam ...	do.	...	...	do.	30	730	1544	1549	794	1200	1132	...	181	149	82·3
4	Shaíkh Mamu	do.	...	...	Tanjore ... S. India.	25	770	1656	1616	770	1178	1244	...	176	142	80·6
5	Takir ...	do.	...	...	Colombo ...	28	820	1712	1610	786	1162	1224	...	191	138	72·2
6	Shaikh Jum	do.	...	...	do.	25	770	1754	1660	830	1220	1244	...	181	146	80·6
7	Shaíkh Katoun	do.	...	...	Tinnevally ... S India.	35	850	1852	1724	806	1246	1320	...	176	145	82·3
8	Sinon ...	do.	...	...	Colombo ...	26	770	1642	1604	720	1182	1210	...	181	149	82·3
9	Mandi Nayna	do.	...	...	Kalapore ... S. India.	25	830	1720	1642	854	1236	1236	...	188	140	74·4
10	Muhamad ...	do.	...	...	Colombo ...	25	790	1720	1680	850	1236	1250	...	182	142	78·0
11	Nather Shaheb.	do.	...	...	Salam ... S India.	40	840	1612	1584	320	1188	1182	...	184	143	77·7
12	Marasa ...	do.	...	...	Colombo ...	25	880	1736	1690	850	1232	1280	...	183	143	78·1
13	Adumi ...	do.	...	...	do.	25	770	1726	1674	816	1220	1264	...	176	140	79·5
14	Hyder Hosain	do.	...	...	Malabar ... S. India.	35	840	1663	1580	804	1552	1170	...	193	133	68·9
15	Puhí ...	do.	...	...	Colombo ...	26	800	1712	1694	842	1206	1222	...	177	142	80·2
16	Salema Cebe	do.	...	...	do.	25	720	1630	1574	790	1162	1182	...	178	144	80·8
17	Hosaini ...	do.	...	...	do.	30	880	1806	1684	846	1236	1284	...	193	150	77·7
18	Kasim ...	do.	...	...	do.	30	840	1654	1592	821	1178	1184	...	169	140	82·8
19	Saidahamid ...	do.	...	...	Tundi ... S. India.	35	860	1692	1550	812	1182	1196	...	186	150	80·6
20	Fakir ...	do.	...	...	Colombo ...	25	800	1650	1581	794	1153	1192	...	173	155	89·5
21	Abdool ...	do.	...	...	do.	26	860	1800	1752	874	1278	1306	...	182	153	83·6
22	Asonlobe ...	do.	...	...	Molialim ... S. India.	40	850	1622	1510	782	1134	1112	...	180	147	81·6
					Average ...		817·7	1699	1625	815·8	1200·6	1221	...	182·0	144	79·1

taken in Ceylon in November 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxillary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxillary-zygomatic index.	Nasal height.	Nasal width.	Nasal index.	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersuperciliary point.	Height from vertex to tergus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
106	137	77·3	48	42	87·5	108	116	107·4	86	127	220	66	468	261	118	267	408
102	139	73·3	48	40	83·3	99	110	111·1	87	128	226	58	465	258	115	259	404
95	130	73·0	49	41	83·6	100	110	110 0	89	119	207	67	425	236	106	237	353
105	123	85·3	50	38	93·4	95	106	110·5	97	133	227	64	446	240	107	244	363
98	125	78·4	50	42	84·0	97	114	117·5	80	129	211	67	460	247	114	248	398
110	140	78·5	47	33	70·2	111	124	111·7	94	124	217	69	462	256	113	255	394
110	130	84·6	46	36	78·2	98	106	108·1	92	123	222	66	493	269	115	270	415
103	131	78·6	52	41	78 8	98	108	110 2	85	134	208	66	447	245	110	244	385
101	133	75·9	49	38	77·5	102	120	117·6	95	137	223	67	460	250	113	250	393
95	124	76·6	48	42	87·5	102	114	111·7	100	140	232	68	465	250	115	224	383
110	136	80·8	43	41	95·3	94	100	106·3	91	139	214	63	444	235	107	262	372
107	138	77·5	43	37	77·0	105	112	106·6	97	124	219	66	463	257	115	258	400
99	123	80·4	51	36	70·5	94	104	110·6	98	135	220	70	480	267	108	240	373
97	123	78·8	45	36	80·0	91	106	116·4	94	134	221	71	440	232	102	260	384
93	123	75·6	50	31	62·0	97	114	117·5	76	123	202	69	454	243	103	257	393
102	130	78·4	50	40	80·0	99	110	111 1	79	142	217	61	430	237	100	237	359
101	135	74·8	50	40	80·0	98	106	108·1	84	118	219	71	478	261	117	260	416
98	124	79·0	47	36	76·5	92	104	113·0	95	118	210	65	443	233	100	246	384
102	133	76·6	47	40	85·1	98	114	116·3	85	137	220	68	437	236	106	243	380
93	131	70·9	42	39	92·8	94	104	110·6	84	139	219	66	453	246	109	232	363
105	137	76·6	51	39	86·6	100	108	108·0	91	135	222	62	475	249	110	259	400
107	131	81 6	50	40	80·0	96	110	114·5	80	127	203	67	437	231	105	257	380
101·7	136·7	74·3	47·7	38·5	80·7	98·5	110	111 6	89·0	130·2	217·2	64·4	455·6	247·2	109·4	250·4	386·5

Measurement of 56 Singhalese

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial numbers.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
1	Tegisapuhani	Goigomá		A	Colombo ...	45	820	1710	1667	880	1230	1220	...	185	148	80·0
2	Jusiapu ..	Káráve		B	Panadu ...	28	780	1620	1574	823	1165	1185	...	184	144	78·2
3	Adrian ...	Goigomá		C	Matra ...	30	850	1680	1661	886	1240	1240	...	191	145	75·9
4	Jakolis ...	do.		D	Colombo ...	30	850	1800	1710	873	1260	1270	...	185	143	77·2
5	Eliasappu ...	do.			do.	25	850	1740	1675	865	1228	1310	...	197	133	68·5
6	Charles ...	Nakati			Galle ...	28	810	1730	1668	870	1233	1300	...	183	145	79·2
7	Abranguapu	Goigomá		E	Colombo ...	42	850	1660	1620	869	1195	1220	...	183	140	76·5
8	Piris ...	do.			Abisawella ...	30	870	1790	1681	885	1850	1248	...	202	142	70·2
9	Somaranark	do.			Galle ...	42	800	1540	1595	857	1183	1190	...	179	152	84·9
10	Jonapu ...	do.		F	Colombo ...	25	820	1680	1660	845	1220	1240	...	173	150	86·7
11	Netorisa ...	Nakati		G	Tangal ...	28	810	1710	1713	890	1235	1290	...	171	136	79·5
12	Abiashami ...	Goigomá			Matara ...	35	770	1810	1709	844	1250	1270	...	178	145	81·4
13	Andris ...	do.		H	do.	35	800	1650	1591	845	1178	1190	...	183	148	80·8
14	Kirinaidé ...	do.		I	Colombo ...	35	825	1745	1700	844	1244	1255	...	187	146	79·1
15	Pudisinh ...	do.		J	do.	30	800	1600	1528	798	1146	1130	...	171	142	83·0
16	Seodoris ...	Radhare		K	Galle ...	25	760	1630	1610	806	1186	1198	...	182	150	82·4
17	Karalisano ...	Nowandan		L	Colombo ...	30	815	1678	1616	780	1180	1194	...	193	142	73·5
18	Batapu ...	Goigomá		M	do.	40	790	1712	1640	836	1200	1220	...	179	140	78·2
19	Devi ...	do.		N	do	30	875	1816	1712	896	1272	1254	...	185	153	82·7
20	Tonisapu ...	Alagamá		O	do.	30	740	1658	1570	770	1154	1164	...	177	151	85·0
21	Sangalilam	Goigomá		P	do.	35	865	1770	1710	886	1276	1244	...	197	144	73·0
22	Konesperis...	do.			Ravanagar ...	32	830	1690	1576	772	1170	1170	...	191	139	72·9
23	Publish ...	do.			Colombo ...	25	785	1604	1563	800	1174	1122	...	182	138	75·8
24	Patusinh ...	do.		Q	do.	30	815	1748	1712	835	1268	1296	...	192	148	77·0
25	Indikapu ...	do.		D	do.	45	820	1608	1686	802	1160	1148	...	183	141	77·0
26	Antonis ...	Julam		R	do.	26	770	1700	1578	780	1170	1162	...	185	145	78·3
27	Aglis ...	Radhare		S	do.	30	790	1692	1604	803	1192	1221	...	176	147	83·5
28	Bhaudra ...	Goigomá		T	Kandy ...	25	790	1630	1624	840	1200	1223	...	196	146	75·0
29	Hemdikapu	do.		U	Colombo ...	30	780	1686	1583	780	1146	1164	...	180	134	74·4

A Velátnárachigé. B Pálamándádige. C Senáráyekge. D Veerasingara.
I Lamanaidilagé. J Bolalisinhalegé. K Jairatmagé. L Indrabaragé.
Q Wanepu kangergé. R Tamolegé. S Khoratholegé. T Disanegé.

taken in Ceylon, in November, 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxilliary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxilliary-zygomatic index	Nasal height.	Nasal width.	Nasal index	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersuperciliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
112	137	81·7	50	41	82·0	105	116	110·4	92	138	223	63	464	258	111	289	412
98	133	73·6	51	41	80·3	103	118	114·7	90	137	218	65	435	252	107	263	368
107	137	78·1	49	42	85·7	105	114	108·5	90	126	221	70	450	260	111	260	408
106	140	75·7	47	36	76·5	107	120	112·1	86	129	219	67	481	245	113	274	400
92	128	71·8	48	37	77·0	103	118	114·5	108	130	227	69	474	260	115	258	390
102	135	75·5	48	46	95·8	109	124	113·7	110	134	245	64	461	250	112	277	408
103	125	82·4	45	45	100	107	122	114·0	100	139	225	68	458	250	111	281	392
106	136	77·9	51	39	76·4	115	136	117·3	90	145	240	61	494	270	123	274	423
97	129	75·1	45	37	82·2	110	118	116·3	110	147	228	70	417	235	102	252	345
96	125	76·8	43	34	79·0	103	120	116·5	101	135	224	68	461	242	106	250	385
101	128	78·9	46	39	84·7	105	122	116·1	100	132	229	62	463	262	106	275	393
103	131	78 6	47	43	91·4	112	128	114 2	97	140	245	66	493	271	120	283	400
95	136	69·8	48	40	83 3	119	130	109·2	92	139	231	70	440	237	108	277	402
90	132	68·1	49	37	75·5	110	128	116·3	101	137	233	70	476	253	104	266	382
103	122	84·4	45	39	86·6	91	104	114·2	88	126	296	61	435	204	106	242	385
112	128	87·5	50	40	80·0	97	110	113·4	83	128	218	64	445	249	108	242	365
92	128	74·2	48	40	83 3	98	110	112·2	80	127	209	70	448	253	106	255	392
104	128	81·2	49	38	77·5	96	112	116·6	89	130	214	65	466	256	112	274	389
97	132	73·4	50	44	88 0	98	114	116·3	83	137	221	67	471	258	115	287	460
98	126	77·7	44	41	93·1	93	106	113·9	93	135	222	66	484	240	114	251	354
102	132	77·2	44	43	97·7	98	108	110·2	101	140	232	65	482	272	115	270	408
100	128	78·1	41	47	114·8	103	114	110·6	89	127	213	59	462	252	113	257	375
106	129	82·1	45	40	88·8	101	114	112·8	86	130	218	65	436	250	105	237	344
107	133	80·4	49	40	81·6	100	116	116·0	96	138	232	69	480	271	115	258	405
92	126	73·0	46	43	93·4	94	106	106·3	87	131	218	65	439	229	101	237	377
98	131	74·8	50	42	84·0	102	108	105·8	79	130	221	68	456	252	114	234	372
102	127	80·3	42	35	83·3	102	116	113·7	92	136	198	71	406	247	111	225	374
106	134	79·1	51	38	74·5	102	112	109·8	94	135	212	59	442	240	108	244	390
93	126	73·8	51	40	78·4	93	102	109·6	105	124	227	63	455	235	109	236	361

E Mankotakaukanamagé. F Wariapperunagé. G Nehuluagolalomlogé. H Koodagamagé.
M Waligomagé. N Eknaikegé. O Kaliperamagé. P Bisampereragé.
U Joygodiarachegé.

Measurements of 56 Singhalese

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial number.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length	Cephalic breadth.	Cephalic index.
30	Charles ...	Goigomá		A	Galle ...	28	790	1741	1640	822	1212	1203	...	186	143	76·8
31	Karole ...	do.		B	do.	30	860	1726	1633	824	1208	1204	...	187	139	74·3
32	Juanith ...	do.			Colombo ...	45	830	1746	1624	704	1194	1222	...	186	142	76·
33	Mesti Gohem	Fishere			do.	40	780	1498	1538	824	1162	1152	...	178	145	81·4
34	Handi ...	Goigomá		C	Galle ...	25	800	1726	1642	834	1210	1232	...	187	155	82 8
35	Tinapu ...	do.			Colombo ...	45	740	1616	1530	784	1114	1082	...	183	145	79·2
36	Haramans ...	do.			Panadora ...	25	760	1680	1672	770	1132	1176	...	176	146	82·9
37	Peris ...	do.			Colombo ...	28	770	1690	1594	834	1184	1170	...	178	143	80·3
38	Habrilapu ...	do.		D	do.	30	720	1576	1546	782	1136	1146	...	172	140	81·3
39	Joanisam ...	Achare		E	do.	30	730	1710	1636	784	1192	1254	...	186	135	72·5
40	Josaf ...	Kara		F	do.	28	840	1750	1636	766	1180	1226	...	176	139	78·9
41	Kaloo Hami	Goigomá		G	Ratnapura ...	25	830	1654	1570	764	1154	1142	...	193	150	77·7
42	Janus ...	Kara		H	Colombo ...	30	760	1684	1562	788	1132	1184	...	186	143	76·8
43	Panchu ...	Goigomá		I	Sapragoma ...	35	860	1750	1730	816	1260	1326	...	188	136	72·3
44	Mahatma. Lakobhanda	do.		J	do.	30	720	1692	1653	830	1210	1223	...	179	142	79·3
45	Arnulusapro	do.		K	Colombo ...	35	850	1700	1720	890	1254	1244	...	181	147	81·2
46	Pererah ...	do.		L	do.	30	740	1694	1614	843	1194	1213	...	187	140	74·8
	Jong ...	Halagama			do.	25	820	1640	1499	804	1124	1186	...	184	140	76·0
48	Leonis ...	Goigomá			do.	32	855	1786	1692	834	1230	1254	...	181	150	82·8
49	Harmanis ...	Kara			do.	32	840	1726	1640	840	1190	1196	...	185	142	76·7
50	Harmanis ...	Halagama			do.	40	760	1620	1616	832	1192	1210	...	178	154	865
51	Bramha ...	Goigomá		M	do.	35	800	1690	1572	804	1174	1160	...	186	151	81·1
2	Siapu ...	do.		N	do.	30	775	1610	1574	774	1130	1180	...	181	135	74·5
53	Arolese	Duráé			do.	25	805	1574	1548	816	1162	1142	...	180	141	78·3
54	Jonasapu ...	Goigomá		O	do.	30	820	1600	1548	832	1200	1186	...	186	146	78 4
55	Salu ...	Salo		P	do.	35	835	1710	1660	820	1220	1236	...	183	146	79·7
56	Andris ...	Goigomá		Q	do.	30	770	1610	1530	782	1150	1142	. .	177	143	80·7
					Average ...		803·3	1683·6	1662·4	815·1	1205·4	1207·6	...	183·5	143·8	78·3

A Bikramakankage. B Mahatigama Acheregé. C Jotinondagé. D Muninarachege.
I Minikangé. J Bodhinaik—Dharmaalaukargé. K Thoodoobhitanege. L Fedibiacharegé.
Q Lokutetigé.

taken in Ceylon in November, 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxillary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxillary-zygomatic index.	Nasal height.	Nasal width.	Nasal index.	Bimalar breadth.	Naso-malar breadth	Naso-malar index.	Height from vertex to intersupercilliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
112	134	83·5	51	41	80·3	95	110	115·7	95	122	230	65	471	257	113	234	395
105	131	80·1	45	34	77·5	94	100	116·9	84	130	212	66	464	252	108	258	409
101	127	79·5	50	34	68·0	100	114	114·0	110	133	232	66	472	257	110	269	385
100	126	79·3	46	40	86·9	97	104	107·2	92	134	215	67	393	222	99	246	360
102	136	75·0	43	40	93·0	101	114	112·8	100	140	237	69	458	261	117	239	380
100	123	81·3	47	40	85·1	90	100	111·1	100	136	225	66	442	237	106	247	373
101	124	81·4	50	36	72·0	93	108	116·1	82	128	210	67	463	241	108	242	356
91	122	74·5	46	34	73·9	92	104	117·3	90	129	214	67	430	250	106	240	378
100	124	80·6	52	37	71·1	91	102	111·9	88	140	220	66	422	242	99	241	350
90	126	71·4	51	37	72·5	95	108	113·6	73	128	211	67	452	237	104	232	371
103	135	76·2	50	39	78·0	100	108	108	100	121	221	68	480	262	117	270	357
103	133	77·4	44	40	90·9	100	114	114·	104	140	230	71	445	254	111	264	394
102	131	77·8	42	37	88·0	94	108	114·8	81	133	207	75	450	240	112	249	380
102	130	74·8	52	40	76·9	95	110	115·7	93	125	222	64	484	264	111	243	395
110	140	84·2	52	41	78·8	107	122	114·0	70	107	206	66	451	257	114	240	380
93	129	72·0	51	37	72·5	94	108	114·8	98	123	227	71	447	256	107	248	379
100	130	76·9	52	40	76·9	93	108	116·1	83	133	218	71	436	245	101	240	384
98	126	77·7	46	36	78·2	91	102	112·0	85	142	207	70	452	253	110	247	362
105	136	77·2	49	41	83·6	95	108	113·6	75	135	214	68	477	266	124	241	392
110	128	85·9	49	39	79·5	102	110	107·8	76	127	218	62	463	247	111	245	376
105	130	80·7	47	39	82·9	95	104	109·4	85	134	218	66	445	233	114	224	352
103	136	75·7	47	42	89·3	101	116	114·8	89	130	226	70	432	238	104	246	385
94	126	78·3	48	40	83·3	90	100	111·1	79	127	208	66	452	234	108	253	351
95	122	77·8	44	36	75·0	93	102	109·6	84	128	211	68	427	227	105	238	386
105	132	79·5	49	41	83·6	100	112	112·0	86	134	223	71	467	242	106	262	395
100	124	78·7	50	39	78 0	100	118	118·0	88	139	212	69	456	249	120	258	379
94	132	71·2	41	40	97·5	98	112	114·2	88	129	203	68	436	231	112	240	360
100·7	129·6	77·7	47·6	39·4	82·7	99·5	112·5	113·0	90·8	132·3	220·4	66·7	454·5	248·3	109·9	253·1	377·1

E Kepitagoleacherigé. F Wandaothadoogé. G Koshpatabatege. H Armandahevagé.
M Gange. N Eloatige. O Lunaracheregé. P Mangoregé.

JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

VOL. LXII, Part III.—ANTHROPOLOGY AND COGNATE SUBJECTS.

No. I.—1893.

The Hindus of Eastern Bengal.—From the papers of the late Dr. James Wise. *Edited by the Anthropological Secretary.*

The Hindus of Bengal claim to be pure Aryans, but the Hindus of Upper India repudiate any relationship with them. The Aryan immigration extended gradually throughout Bengal, and the tie which bound the settlers to their faith and peculiar usages was relaxed by residence among aliens. The example of races untrammelled by caste or religious scruples also led them to shake off all bonds and assert greater freedom of action. The priesthood formed illegal connections and neglected their religious duties, while the mixed offspring observed none of the Bráhmanical ordinances. In the tenth century corruption and irreligion being universal, Ádisúra introduced priests, trained in the orthodox school of Kanauj, to reform and educate the people. But the arrival of a small body of religious teachers did little towards elevating the Bráhmans, or laity, and in the twelfth century Ballál Sen found only nineteen families of the Ráṛhí Bráhmans living in strict obedience to all that their religion demanded These families were raised to the highest rank, but those who had forfeited all respect and formed illegal marriages were reduced to secondary, or even lower grades. The innovations made by this monarch only affected the Ráṛhí and Varendra

Ṣreṇi, or orders, for the Vaidika and Bhaṭ, refusing to be classified by a Vaidyá, retired into the hill countries of Sylhet and Orissa; and the other tribes, who had become hopelessly demoralised, were left untouched.

The chief object of the reform organised by Ballál Sen was the creation of an aristocratic and powerful hierarchy, placed in such a position of dignity, that no misdemeanour and no immortality could deprive it of hereditary privileges, or the reverence of the lower classes. An illegal marriage was the only transgression entailing loss of rank and forfeiture of respect. No provision was made in this new code for the elevation of the lower ranks when families became extinct; consequently, as Kulín houses disappeared, the difficulty of procuring husbands for daughters vastly increased, and when the third recognisation of the order was made by Deví Vara, in the fourteenth century, polygamy and the buying and selling of wives was the engrossing occupation of the twice-born Bráhmans.

In spite of these successive endeavours for securing the purity of the Bengali Bráhmans, it is remarkable that Kanaujiya, and other Bráhmanical tribes of Hindustan, have always despised and repudiated any connection with their Bengali brethren. In their religious and domestic ceremonies, habits of life, and mode of living, Bengali Bráhmans are quite distinct from any of the other tribes, and the only point of attachment between them is when outcast Kanaujiyas marry Ṣrotriyá maidens and become absorbed into their ranks. Although clinging with characteristic pertinacity to all the prerogatives of their order, modern ideas are gradually undermining their bulwarks, and the exclusive rules are step by step yielding to education and the progress of the nation. Kulín Bráhmans are now found adorning the bench, the bar, and the medical profession, and, while proving useful members of society, exert a rare influence for good over their Hindu countrymen.

Besides the Ráṛhí and Varendra tribes, there were in Bengal four inferior classes of Bráhmans left out of the organisation of Ballál Sen, namely, the Vaidika, Sapta-ṣati, Áchárya, and Agradána. The three first claim to have been resident in Bengal before the reign of that monarch, and the services of all the four are still required by the Ráṛhi Ṣreṇi at many important ceremonies. The Vaidika is the only division that has preserved an honourable position; but whether this is owing to their being descendants of Kanaujiya Bráhmans, to the respectability and decency of their lives, or to their independence of character, is very doubtful. They decline to give their daughters in marriage to the Kulín Bráhmans of Bikarampúr, and refuse to act for any clean Ṣúdra, or Bráhman, unless his family can trace their origin to Kanauj. The

Sapta-ṣati, undoubtedly one of the oldest Bengali septs, is gradually being absorbed by the Ṣrotriyá, and few confess they belong to it. In a few years they will be sought for in vain. The Áchárya and Agradána are Bráhmans only in name. The former are chiefly employed in secular occupations, and in discharging duties useful, but unknown, to the Vedas or Puráṇas. The Agradána, claiming to rank above Áchárya, is the most despised of the sacred order, and clean Ṣúdras, as well as Patit Bráhmans, would be degraded by eating with them.

The Patit Bráhmans are the most active representatives of the Hindu hierarchy, having fallen from their high estate by neglecting religious duties, officiating in Ṣúdra temples, marrying into inferior grades, or acting as Purohits to the Varṇa Ṣankara.[1] The loss of rank has in some respects been mitigated by the affection and devotion of the laity, and by the high social position given by the caste for which they officiate. It is to this class, abandoned by the Kulíns, that India owes the spread of the Hindu religion among the wild tribes of the Taráí, Assam, and Eastern Bengal, and the conversion of the semi-Hinduised aborigines throughout Bengal. Bad and immoral many of these Ṣúdra Bráhmans are, but as a class their lives are not one long course of depravity and selfish indulgence, as is too often the case with the Kulíns. Education has made no progress among them, and holding the position they do, concession to the wants of the age is not to be expected. Their hold over the men is slowly loosening, but the women still obey and worship them, and while this subjection lasts, Hindu caste and Hindu exclusiveness will remain.

Though not recognised in books, many social grades are found among these fallen Bráhmans. Those ministering to the Nava-ṣákha,[2] popularly called Ṣúdra Bráhmans, occupy a position of comparative distinction; but at the bottom of the scale Bráhmans appear, who are accounted lower than the vile caste they serve; while such an individual as the Chaṇḍal, or Ḍôm Bráhman scarcely deserves to be called by that proud title.

The Vaiṣya caste, standing next the sacred order, occupies a very anomalous and strange position. Their claim to be genuine Vaiṣyas is admitted by the higher classes, but the Ballálí Vaidya and Káyath refuse to touch food prepared by them. This small caste deny that Ballál Sen reorganised or interfered in any way with their regulations, and for this reason it remains isolated and unrecognised by Hindus.

The two next castes are the Vaidya and Káyath, who repudiate the name of Ṣúdra, and maintain that Ballál Sen did not enroll them

1 Literally, mixture of colours: hence mixture of castes.

2 Or Nava-Ṣayáka, the nine inferior castes.

among the "Nava-Ṣákha." Both are satisfied to rest their title of superiority on the fabulous births of their reputed ancestors. Ballál Sen belonged to the Vaidya caste, and it is to his partiality that it secured pre-eminence. On one section the Bráhmanical cord was bestowed, although the caste profession was a dishonourable one, and Ghaṭaks were engaged to preserve the family purity. There has always existed much latent jealousy between the Vaidya and Káyath, but the latter acknowledge some inferiority, although the cause of this difference is never defined.

The Káyath is undoubtedly one of the oldest tribes in Bengal, but it is unnecessary to believe all that is said of Ádisúra and the five servants of the five Kanaujiya Bráhmans. One branch, the Bangaja,[1] has been settled for many generations at Edilpúr, along with the caste Ghaṭaks, and Kulín Káyath families are as punctilious and as vain of their birth as any Gánguli, or Mukharji, although the Lálás of Mathurá and Agra laugh at such pretensions, and will not recognise them as Káyaths at all.

The Kevala, or pure Ṣúdra, does not exist in Bengal. All castes below the Bráhman belong to the "Varṇa Ṣankara," being the offspring of parents of different tribes.

The recognised authorities on castes are the Institutes of Manu, the Játi Nirṇaya chapter of the Brahma-Vaivartta Puráṇa,[2] and the Játimálá. According to the Bráhmans it was the wickedness of Veṇa, the Rájarshi, who ordered that no worship should be performed, no oblations offered, and no gifts bestowed on Bráhmans, and caused the people to disobey the laws and intermarry with prohibited classes. Until his era Bráhmans only married Bráhmans, Ṣúdras, women of their own rank, and Chaṇḍáls followed their own tribal customs. It was natural for the priests to attribute the irreligious propensities of the people to a cause like this; but there is no doubt that laws prescribed by the Bráhmans for maintaining the purity of their order must have been soon violated by those in whose favour they were enacted. Although marriages between individuals of different tribes gave origin to the Varṇa-Ṣankara, or mixed castes, the Puráṇas give other explanations. According to the Bráhma-Vaivartta Puráṇa, the gardener, blacksmith, shell-cutter, weaver, potter, and brazier are descended from the offspring of Viṣvakarma, the celestial architect, and Ghṛitáchi, an Apsara, or nymph of heaven, and hence it is that all Kárus, or artisans, worship their progenitor with exceptional reverence. The reasons, again, why certain

[1] Banga, or Vanga-ja, Bengali born.

[2] A synopsis of this is given in the *Calcutta Review*, vol. xv, p. 60.

castes are degraded are often quite ludicrous, but this does not cause their rejection. The Sútradhára lost rank for refusing to supply the Bráhman with sacrificial wood; the Chitrakára for painting execrably; and the Suvarṇakára for stealing gold given him to mould an idol. The modern Súnṛí moreover, does not resent being told that his ancestor was created from the chips of the mutilated trunk of Ganeṣa, nor the Kumár that Ṣiv transformed a waterpot into the first potter.

According to the classification of Ballál Sen, as interpreted in Eastern Bengal, the nine following castes are considered pure, and the so-called Ṣúdra Bráhman officiates for all:—

Ṣánkhárí.	Kumár.	Gop-Goála.
Tántí.	Málákár.	Madhu Nápit.
Kámar.	Nápit.	Baaáí

Judging, however, by traditions still surviving, the position of a caste in the new roll depended chiefly on its usefulness and importance to the community at large. The profession which had proved itself essential to the comfort or welfare of the Hindu hierarchy was at once promoted to a higher level, while the less important was reduced. Thus, the Tántí, unclean in Bihár, became clean in Dacca, and the indispensable barber was raised to the same social level as the Káyasth. The relative position of the various castes is still a burning question in Bengal, and in large villages where any caste predominates, its claims to superior rank are usually conceded. For instance, the Gandha-banik, Telí, Támbúlí, and Kánsárí often assert, to good purpose, the right of being enrolled among the nine, and if their voice be sufficiently loud and influential it will be heard.

The Nava-Ṣákha have five servants, or Pancha-vartta, attached to them in common, who possess the prescriptive right of attending at all caste and family celebrations. The five servants are the Bráhman, Málákár, Dhobá, Nápit, and Naṭa, or musician, who are presumed to be exclusively engaged in the service of the Ṣúdras, but they also earn money by waiting on lower castes. Even now-a-days some work for the Súrya-vañsi, who ten years ago were not Hindus in name, while others readily work for the Báotí, Kapálí Kawálí, Paráṣara Dás, and other tribes of doubtful origin. Where the fisher castes are numerous and cannot be overlooked, no difficulty is found in engaging their services. They work indeed for all castes employing a Patit Bráhman, but the utterly vile tribes, the Bhúinmalí, Chamár, Paṭní, and Súnṛí, having Bráhmans of their own, are not served by the Pancha-vartta. To this general rule, however, there are exceptions. The worshipful barber, for instance, condescends to shave, but will not pare the nails of the Sáha rice merchant.

Although caste is no longer revered as an old institution sanctified by religion and immemorial usage, and is disappearing before the assaults of modern civilisation, a tendency to the formation of new castes still exists. Semi-Hinduised races are being enrolled among Hindus and old established castes are being split up by adopting new occupations. But if this new occupation be not dishonouring, the Purohit continues his ministration. For instance, the great Chandal tribe has given off eight branches, yet the Chaṇḍal Bráhmans officiate for all. On the other hand, the agriculture Kaibarttas, having taken to a base employment, are obliged to support a Purohit of their own.

Between the Ṣúdras and the Nícha, or vile castes, many tribes, organised by degraded Bráhmans, or united by the exigencies of modern civilisation, are found occupying an uncertain position, exposed to the sneers of the exclusive and conservative Ṣúdras.

These intermediate castes are—

Báoti.	Kándho.	Lohait Korí.
Baqqál.	Kapálí.	Nar.
Bháṭ.	Karní.	Paráṣara Dás.
Beṛua.	Karrál.	Páṭial.
Halwah Dás.	Kawálí.	Sutár.

In the Tantras,[1] the epithet Antya-ja, or inferior, is applied to the following seven tribes:—washerman, currier, mimic (Naṭa), fisherman, "Meda," or attendant on women, cane-splitter (Varuda), and mountaineer (Bhilla). The term Antyávasáyin, or dwellers outside the town, was given to the Dôm, Pan, Hárí, and other sweeper castes.

We, however, possess a very correct list[2] of the outcaste tribes in Bengal in the roll of pilgrims excluded from the temple of Jagannáth. If prohibited castes are distinguished from professions there are only eleven castes so utterly disreputable that they dare not enter the sanctuary. These are the—

Súṇṛí.	Kahár.	Tíyar.
Nama-Ṣúdra.	Ráj-Vaṇsi.	Bhúinmálí.
Dhobá.	Chamár.	Háṛí.
Jogí.	Ḍôm.	

Much information regarding caste, as understood in Bengal, is obtained by comparing the relative position of Hindustánís who reside, or temporarily sojourn there, with that of castes native to the province.

Permanent residence is always attended by social expulsion, but a stay of a few years is with some castes a disqualification, with others it

[1] Colebrooke's *Essays*, ii, 164.

[2] Harington's *Analysis*, iii, 213; Hunter's *Orissa*, i, 136.

is not so. For example, the Ahír, Surahiyá, and Kanaujiya Bráhmans, who keep up communication with their kindred and marry from their own homes, are reckoned pure; but the Kahár, Ahír, and Kándú domiciled in Bengal forfeit all claim to be considered stainless. By adopting local Ṣúdra customs and marrying with women of the country Hindustání tribes are stigmatized as "Khoṇṭá," or debased. The Kanaujiya Bráhman, again, expelled by his family for these delinquencies, finds shelter in the ranks of the Srotriyá; but above this he cannot expect to rise, and his children must be content with a very ambiguous position.

The steps by which a Hindustání caste loses its original rank and gains a new one may be traced in the case of the potters. The Kumhár of Bihár is always unclean in Bengal, but if he marries a kinswoman he may return to his home without loss of rank. The Ráj-Mahállia potters however, being in an intermediate state, have neither risen to an equality with the Bengali Kumár, nor remained unclean like the Kumhár. The Ṣúdras of Bengal drink from their water-vessels, and, still more blessed, the Súdra Bráhman ministers unto them. Lastly, the Bengali Kumár, originally of the same stock, has become in the course of ages a pure Ṣúdra and one of the Nava-Ṣákha.

In no instance, however, is the separation between kindred castes so striking as with the Chamárs and Rishís. Both belong to the same tribe, both are equally vile in the eyes of Hindus, and both live apart from all other castes, yet similar occupations not only excite jealousy and enmity, but prevent all friendly intercourse between them.

Occupations, moreover, which a Hindustání may engage in at home without stain or obloquy, are sometimes unbecoming when the habitation is in Bengal. Thus the Dômni and Chamáin, professional musicians in Upper India, are disgraced by playing for hire in Bengal, while on the other hand, such menial work as the Mungírya Tántís perform in Dacca would be considered very debasing in their own district

Although continuous residence at a distance usually repels, a brief sojourn sometimes draws together, disunited sub-divisions. Thus the different branches of Ahìrs and Chhatrìs intermarry in Bengal and lose caste, although debarred from doing so in Hindustán.

The Bráhmanical order to which the Purohit belongs is generally a nice test of the rank accorded to a Hindustánì caste. Among the lower tribes the Guru belongs either to one of the Daṣnámi orders, or he is a Vaishnava Bhagat, who visits his flock at regular intervals, confirming the old, and teaching the young the rudiments of their faith. Maithila Bráhmans, on the other hand, ordinarily act as Purohits to Kurmì, Chhatrì, Kándú, Ahìr, Cháin, and Kewaṭ; but Chhatrìs are occasionally found with a Sarsut, or Sarasvatì, Bráhman, and Kurmís

and Dosádhs with a Sákadvípa. The Kanaujiya tribe again ministers to Binds, Tántís, and Gádariyás. In the case of the Raṇḍa Khatrís, whose parentage is equivocal, the strange phase is found of a Kanaujiya acting as Purohit, a Ṣrotriya of Bengal as Guru.

A most important distinction between Hindustání and Bengali castes of similar origin, is the religious belief found among them. It may be said with perfect truth that Vaishnavism, in one or other of its diverse forms, to the exclusion of Ṣaivaism and all other creeds, is the faith professed by the agricultural, artizan, and fisher tribes of Bengal. The worship of Kṛishna has for obvious reasons attracted well nigh all the Goála and other pastoral tribes of India. The teaching of Chaitanya and his successors has made little progress among Hindustání castes, but the sympathetic creeds of Kabír and Nának Sháh have attracted multitudes of disciples. The Kurmís and Dosádhs especially patronise Kabír; the Kewaṭs, Kumhárs, and many Dosádhs enroll themselves under the banner of Nának.

It is among castes from Northern Bengal, such as the Kándú Bind, Muriárí, and Surahiyá, that the followers of the strange Pánch-Píriya creed are to be met with. Other curious sects, unknown to Bengal, are also found in their ranks. The Tirhutiyá Tántìs are members of the Buddh Rám communion. Kurmìs often profess the doctrines taught by Darya Dás, and many Dosádhs those of Tulasí Dás. Still more worthy of notice is the existence among them of an old prehistoric cultus. The apotheosis of robber chiefs by Dosádhs, the deification of evil spirits, as Rahu by the Dosádhs, Kasi Baba by the Binds, and Madhu Kunwár by Tántís, and the animistic idea, endowing with life and personality the destructive energy of the Ganges, are all forms of belief unknown to castes native to Bengal.

The Marriage Customs of Tibet.—By Sarat Chandra Das, C.I.E.

PART I.

The Ancient Marriage Customs of Tibet,

(As now prevailing in Purang, Nah-ri, and the country round Lake Manasarovara.)

Marriage by capture, as it now, to some extent, prevails in Purang and the country round Lake Manasarovara, existed in former times in Tibet and in the Cis-Himalayan countries. In U and Tsang comparatively few remnants of this ancient custom now remain, though in Sikkim, Bhutan, and the Himalayan district of Spiti, near Kulu, a

survival of it may be traced in the part played by the *kún-chan* (thief) in marriage ceremonies.*

In Purang when a young man wishes to marry a girl, he watches her movements, and carefully ascertains the places where she frequently goes for agricultural or pastoral work. When he finds a good opportunity, he comes, accompanied by one or two of his friends, and tracks her to the field, or to the pasture where she happens to go, and finding her alone carries her by force to his house. He keeps her confined in a separate house so as to have abundant opportunity of soliciting her favours. He provides her with good food and nice clothes and remains near her to coax her and to win her love. When he goes out of the house he leaves some one of his trusted friends to guard her against seductions of other men and the attempts of her parents to take her away. Sometimes her parents come in search of her, or send men to fetch her home. If the girl be unwilling to live with her captor, or if her parents do not permit her to marry him, the matter is settled by the village elders or the tribunal of the *Jong-pon* (district chief). If they permit the union, an auspicious day is fixed for the marriage when a good deal of *chang* (wine) is consumed. The entertainment on the marriage occasion is therefore called *chang-thûng* (drinking of wine).

Marriage by elopement.—When a girl has given her heart to a young man, but her parents will not let her marry him, she elopes with him. He is helped in the elopement by two or three sturdy friends, who accompany him to prevent a rescue on the part of the parents and to see the couple safely through. Having brought her to his home he accommodates her in a good house engaged for the purpose. Here he conceals her and enjoys the honey-moon, by taking care to employ a number of strong men to guard his bride from being carried away by other men or

* Spiti. *Polyandry,*—Marriage customs.—In Spiti polyandry is not recognised, as only the elder brother marries, and the younger ones become monks. But there is not the least aversion to the idea of two brothers cohabiting with the same woman, and, I believe, it often happens in an unrecognised way, particularly among the landless classes who send no sons into the monasteries. I heard in Spiti, that when the bridegroom's party goes to bring the bride from her father's house, they are met by a party of the bride's friends and relations who stop the path: hereupon a sham-fight of a very rough description ensues, in which the bridegroom and his friends, before they are allowed to pass, are well drubbed with good thick switches.

In Spiti there is a regular ceremony of divorce which is sometimes used when both parties consent. Husband and wife hold the ends of a thread, repeating meanwhile:—"One father and mother gave, another father and mother took away: as it was not our fate to agree, we separate with mutual good-will." The thread is then severed by applying a light to the middle. After a divorce a woman is at liberty to marry whom she pleases. (*Crooke's Notes and Queries, &c.*)

by the friends of her parents. In the meantime his friends, or father, or relations go as *lóng-mi* (begging men) to the house of the girl's father. They take with them some presents for him, and also provisions for their own use during the time they remain there. They do not venture to go near the house of the bride's parents, but remaining at a distance of about a hundred yards or more from it, swing a *khatag* (salutation scarf) to say that they have come to humbly propose the auspicious marriage of their daughter. At first the parents and their friends take no notice of this and decline to look at them. The *lóng-mi* continue their silent entreaties for three or four days, and do not leave the place until by their importunity they have moved the hearts of the bride's parents. The father of the girl then brings them before the elders of the village, and asks the latter to inflict on them the punishment they deserve for having stolen his daughter.

If the *lóng-mi* abide by their decision and pay the fine immediately, the marriage proposal is formally received by the bride's parents. In the meantime the bride returns to her father's house. Then an auspicious day is fixed for the wedding entertainment which is called *chang-thûng*, when the friends and relatives of the bridegroom come to fetch the bride to the bridegroom's place. The bridegroom being conscious of his guilt dare not visit the house of the bride's father, till a long time after the completion of the marriage. If he indiscreetly happens to go there he is given the appellation of *kûn-chan* (thief), and dealt with accordingly.

Among the upper classes in Purang parents generally arrange for the marriage of their sons and daughters. First of all comes the betrothal.* When the parties betrothed reach the proper age, *i. e.*, about two or three years after attaining to puberty, they are married. The bridal party,

* Among Ladákis, betrothals, which are the occasion for a little drinking of tea and *chang*, are arranged by parents in consultation with relatives. Having fixed upon a match, which, from a worldly point of view, seems desirable, they then refer to the *Lámás*, to see if the destinies of the proposed couple suit. If they are found to be unsuited the betrothal is given up. A youth is betrothed when he is about 20 years of age, and a girl perhaps two years earlier. After the betrothal or "*tea chang stär ches*," the wedding, or "*Pagston*" may take place within a month, or it may be put off for a year or more. If a male child possessing property, is left alone in the world, he is betrothed at once to some fully grown woman, who acts as his nurse during his childhood, and as his wife during his later years. This is not found an inconvenient practice, as a Tibetan may have two "little wives" in addition to his original "*Pagston*" wife. The dowry (*kinto*) is fixed at the time of betrothal, but it is not given till the marriage takes place, and some times even after that. This dowry is paid by the bridegroom to the father, or other near relative of the bride.—"*Captain Ramsay's Western Tibetan Dictionary*," p. 10.

which consists of the kinsmen and relations of the bridegroom, carrying with them presents of clothes for the bride, and provisions for the marriage entertainment, proceed on an auspicious day to fetch the bride from the house of her father. The friends of the bride erect nine stone cairns called *tho-do* in the way, each about a hundred yards apart from the other. The bridegroom's party wait at the ninth *tho-do* which is farthest from the house of the bride's father, and in the hearing of the bride's friends, who come to meet them there, describe the personal beauty and accomplishments of the bride and the bridegroom, and also pointing to the *tho-do* say that it is the first barrier that the demons have set up and that it bars their way like a mountain. If they depart from the customary description of the gods and the demons, or commit any mistake in the manner of describing the *tho-do*, the friends of the bride become angry and break down the mound. Then the bridegroom's party must apologise and again describe the mound and the couple to be united. In this manner they halt at every one of the *tho-do* and describe them according to the custom of the country. At the last *tho-do* which is consecrated to the gods, they sing the praise of the bride, her parents and their tutelary deity, and say that as they have come thus far after having surmounted the nine valleys and nine mountains (*la-gu* and *lûng-gu*) they hope that the gods will help them in their mission.

At the house of the bride's father they are received with kindness and entertained with tea, *chang*, barley flour and the three kinds of meat, cooked, dry and raw. They present a milch yak with her calf to the bride's mother as the price of the bride, called *nu-rin* (price of the mother's milk), and also two milch yaks to the father as the *ñah-rin* (price for (his) back). They also make presents of money and scarves to the relations of the bride's parents, and return to the bridegroom's house with the bride and her dowry, &c.

Preliminaries of Marriage in U, Tsang and Sikkim.

Parents generally arrange for the marriage of their sons and daughters, when they have passed the age of puberty. At the outset of a marriage proposal, it is necessary for the parties to be furnished with the names of the years in which they and their respective parents were born. This is considered essential for the purpose of ascertaining the *thun-tsi* calculation of the harmonious conditions of marriage in the parties to be united. For this object two or three astrologers are employed to arrive at independent results, working on different astrological data.

The application to astrologers for calculation is generally accompanied by some presents, consisting of *sum-tshan* (articles of three varieties), a

tray full of rice, a quantity of barley flour and a few bottles of wine. Receiving these presents the astrologer spreads his astrological chart, called *tsi-thang*, on a little table, and places in front of it a jug full of wine to offer *serkem* (libation of golden drink) to the gods, a miniature flag called the *dah-dar* (a silken flag of five colours attached to the sharp end of an arrow), and burning incense. He then puts a few white and black balls, of the size of a pea, on the chart, and throws them on it in the manner of dice to ascertain the good and bad luck of the parties to be married. After noting down the years of birth of the parties he gravely sits on a cushion to perform the ceremony of *den-dar* (the Test of Truth) of his calculations, and makes the following invocations:—"I pay homage to Buddha—his Law, and the Church, and vow to be under their protection, till I shall have entered the state of supreme enlightenment. By the moral merits of my good deeds, such as charity, forbearance, &c., let all the living beings of the world be benefited, and thereby let me attain to Buddhahood. Let all the animate beings of the world come under the influence of Truth, and the causes of Truth, and also be free from misery, and the causes of misery. Let them also not be devoid of Truth, which is free from misery, and abide in that even state of mind, which is free from corruption, partiality and passions. Let me gain perfection as quickly as possible, that I may work in the cause of all living beings of the world. It is with a view to serve them in respect of the sciences of astrology and divination, that I now undertake to perform this religious service." With this introduction the officiating astrologer invokes the aid of all the gods of the ten quarters, Buddhas, Boddhisattvas, sages, saints, &c., to help him in the work of mystic calculation:—

"O holy Lámás who have passed away, are now present, and will appear hereafter in this world, pray, bear me out in this test of Truth! O infallible prince of the Śákya race, O sage of Udyána, Padma Sambhava! O ye masters of the Sûtras, Tantras and the *mantras*, lend me your help in this test of divination, for nothing in this world is hidden from you.

"O *Rig-sum Gon-po* (Mañju) Śrí, Vajra páṇí, and Avalokíteśvara, Saṅgye (Buddhas) Chaṅgsem (Boddhisattvas), the science of numbers and of the stars, the Sûtrántas and the sacred works on divine prophecies!—Judge ye all of my skill.

"O Brahmá Chaturmukha (thou with four faces)! O Nága Rájá whose head is formed of seven serpents! O mighty *Vijayá*, the goddess who rules over the elements! O sage Kapila Muni! O Kung-fu-tse (Confucius), the miraculous prince of China! O saints and Vidyádharas!—Ye are all witnesses to my work.

"O the four great sages of China, the four saints of Tibet, and the Pandits and Lochávas of India and Tibet!—Help me in this test of Truth.

"O ye five kinds of Brahma-Káyika Devas, who rule over the fire in the South, over the wood in the East, over the adamantine mountains in the West, over the Ocean in the North, and over the ethereal space in the middle region!—Bear me out.

"The eight great planets, the sun and moon, the Pleiades and the 78 constellations!—Do you all test the truth of my science.

"The great gods including Brahmá, the eight *nága* demons headed by Nanda, the four Mahárája Káyikas, the guardian kings of the world, and the seventy *Palgon* (the noble spirits who defend Buddhism)!—Help me in drawing true conclusions from astrology and the science of divination.

"The four celestial nymphs called Man-tsun Chen-mo, (Mahá Mátriká) who preside over medicine, the twelve sylvan goddesses called the Ten-ma Chuñi, who under a solemn compact have become protectors of Buddhism in Tibet, the local gods and demigods, together with your attendants, the kings and ministers!—Bear ye all witness to my work.

"The nine mystic figures called the *Me-va gu* and the eight gnomons on the chart of divination called the *Parha* and the cycle of sixty years!—Receive homage from me.

"The grey tiger that keeps the farthest end of the Eastern Quarter, the blue dragon of the South, the red huge bird of the West, and the golden tortoise of the North!—Receive your share of respect from me.

"I make this religious service which is threefold, being exoteric, esoteric and mystic, to honour you, and I make offerings to you for granting me power to arrive at accurate results in calculating astrological events and to divine correctly. Will you, therefore, explain to me the science of divination, and demonstrate every fact and figure connected with it as clearly as reflections fall on a mirror of polished silver?

"To-day we are to ascertain whether the youth and the maiden to be united are possessed of the ten virtues of matrimonial concord (*m*thun-*s*byor); the twenty characteristics of demeanour (*h*gro-lam); If they will deserve the ten kinds of dowry, and also the services of five men necessary for conducting wedding ceremonies. O Venerable Lámás and learned elders! Shew unto me all that is essential for astrology, and correct me when I err."

Then taking the names of the years of the birth of the males and females of both sides, the astrologer ascertains the chances of life, *i. e.* (longevity), accidents to the body, power (*wang-thang*), and prosperity (by observing the *R*luñ *r*ta *wind-horse* or fortune), and by setting these

four against each other by the throw of the back and white balls on the chart. The good and evil of life, and the *wind-horse* of the male's year being calculated, are set against those obtained from the female's year. Again the body and power of the female's year are set against those calculated from the male's year. If in the throw of the globules the white ones turn up in favour of the parties to be married, good luck is prognosticated, and the *thun-tsi* is ascertained.

If the good and evil of the life of the male harmonize in the calculation with those of the life of the female, longevity is counted upon. If not, the happiness of the couple will be short-lived.

If in the calculation the accidents to the body of the male agree with those of the female, the astrologer declares that the marriage will be happy in respect of issue. Want of harmony in the persons of the parties indicates barrenness.

If the *wang-thang* (power) of the male corresponds with that of the female, the astrologer declares that the parties will be prosperous in reference to wealth. Want of harmony in *wang-thang* in the parties indicates poverty and waste of wealth.

If the *wind-horse* (fortune) of the male agrees with that of the female, the marriage is predicted to be a very happy one, as love and concord are sure to attend them, and to be the guiding principles of their life. If the *wind-horse* of the one run counter to that of the other, the marriage is pronounced to be unlucky and unhappy, as the parties would then constantly fall out.

When parties are anxious to be married in spite of adverse astrological results standing against the union, the astrologer ascertains how many of the circumstances are favourable to the parties, and how many against them. If they agree in three-fourths of the circumstances, religious observances are necessary to avert the dangers consequent on the disagreement in the remaining one-fourth; but when at least one-half of the circumstances stand against the parties, no religious observance is supposed to be of sufficient efficacy to avert the dangers of an inauspicious union. The proposal is then dropped, and another maiden is sought.

The Tibetans use different kinds of astrological charts and calculations which are based on Indian and Chinese methods. The astrologer failing one kind of calculation tries another. When astrology fails, divination, by deciphering the mystic marks on the back of the fabulous golden tortoise is resorted to. In this manner the astrologer of Tibet makes a busy trade of his craft, the like of which is seldom seen either in India or China. Among the priestly crafts of Tibet none is considered so lucrative as that of the astrologer.

As soon as the astrologer declares that the *thun-tsi*, *i. e.*, the circumstances of harmony necessary in the marriage are favourable, the parents consult their friends and relations in order to ascertain the suitability of the match, and send one or two *bar-mi* (go-betweens) to ascertain the views of the maternal uncle of the maiden selected regarding her marriage. He generally withholds his opinion under various excuses. According to the customs of the country the *Shañgpo* (maternal uncle) of a maiden is the real arbiter of her fate in the matter of marriage. Nothing can be settled without reference to him. When his leave is secured the marriage proposal can be formally made to the maiden's parents.

The *bar-mi* with the permission of the *Shañgpo*, on an auspicious day during the increasing lunation of the month, proceed to the house of the parents of the maiden to present them with the *lóng-chang* (in Sikkim *nang-chang*) and therewith formally make the proposal of marriage. The word *lóng-chang* is derived from *lóng*, to beg or apply, and *chang*, wine, meaning the present of wine to apply for marriage, In Sikkim the candidate for the maiden's hand accompanies the *bar-mi*. but in Tibet the case is otherwise. On the way they observe omens and prognostics. If they see any empty vessel they turn back.

The *lóng-chang* consists of the following: at least a gallon of wine, a silk scarf, five silver coins, and five or nine kinds of things placed on a tray. The *lóng-chang* is required to be carried by a man who has been the father of several sons and daughters. Under no circumstances is a widower, or one who is childless, or whose children have died, allowed to carry it. The parents of the maiden receive the *bar-mi* with politeness, and serve them with wine and tea. After emptying one or two cups of tea the *bar-mi* present them with a scarf, and beg for leave to state their mission. The parents at first shew some indifference to their request, and try to turn the conversation on some current topics of the day. The *bar-mi* press the point they are interested in, and say that they have come with the *lóng-chang* to beg for the gem (their daughter). They are then told that the giving up of the *norbu* (gem) is no trifle, and so they should not be too sanguine about getting it.

If, after repeated entreaties, they succeed in getting any assurance of good will from the maiden's parents they open the wine bottle belonging to the *lóng-chang* and pour wine into the cups of the friends and relations of the parents who happen to be present on the occasion. At this stage the parents make the following remarks:—

"According to the common saying of the country the maternal uncle is the owner of one half of the person of his niece or nephew, just as half the cloth of a robe belongs to the sleeves. Accordingly if the

maternal uncle of our daughter, and also her relations and friends, agree to the proposal, it will be possible for us to accept the *lóng-chang ;* but otherwise we must return it."

It is therefore necessary first of all to arrange the marriage business with the maternal uncle. The proverb says, "Both in marriage and merchandise there should be no kind of solicitation." So the party that has won the maternal uncle over to his side need not shew any anxiety for the acceptance of the *lóng-chang.*

If the *bar-mi* can any how induce the parents to drink a cup of wine from the *lóng-chang* the betrothal is effected. But they studiously avoid partaking of anything pertaining to the *lóng-chang* before consulting the maternal uncle.

Marriage Ceremonies of Tibet (U and Tsang).

After accepting the *lóng-chang* the parents of the maiden in consultation with the *lóng-mi,* called *bar-mi* in Sikkim, and the astrologer fix an auspicious date for celebrating the marriage.

The bridegroom remains at home. His friends and relations proceed to the house of the bride's parents to fetch her. No music nor dancing mark a Tibetan marriage at the outset.

On the appointed day the parents of the bride make the necessary preparations for receiving the bridegroom's party who come dressed in their best apparel. Being seated on low or high cushions, according to their respective rank and position, the guests are regaled with tea and wine and dainty dishes. A quantity of barley flour, red potatoes, biscuits and cakes in wooden trays, and meat (boiled, dried and raw) in brass and silver trays, are placed before the principal guests.

In the meantime the bride is taken to her toilet. First her hair is washed, to which she reluctantly submits, shedding tears at the idea of separation from her parents and friends. These try to console her with kisses and show of affection. Her nearest female relations come to soothe her mind with kind words. The bridesmaid (sent from the bridegroom's parents), comes to help her in her toilet; She plaits her hair and dresses the locks in the form of a crown decorating them with strings of pearl, and turquoises. She then puts on her ornaments of gold and silver, coral, amber, ruby and other precious stones.

The marriage festivities generally last for three days at the house of the bride's parents, when their friends and relations avail themselves of the opportunity of shewing their good-wishes to them by making presents to her. The parents first arrange for the dowry, then the relations send their presents, and last of all come the personal friends and acquaintances of the bride to make the bridal gifts and to wish her a

long conjugal life, of prosperity and happiness. The presents are then collected and made over to the best man with a list of them. As soon as he comes to receive them, the companions of the bride by way of of a joke, secretly remove his earring, head dress, wrapper or any other article they can get hold of belonging to him. At the time he takes no notice of their jokes, but on the following morning he complains to them about the loss of his things, and offers a reward for their recovery. A present of three to four *srang* (ounces of silver) to them secures him the return of the lost things.

A Tantrik priest called *Ñag-chang* performs the ceremony of propitiating the *Pholha* (the household god) with incense burnt at a conspicuous place. The representative of the bridegroom now makes a present of five or nine varieties of articles to the mother of the bride, and says that as the usage of the country sanctions the offering of what is called the *nu-rin* (the price of mother's milk) she must accept it.

When the bride leaves the house of her parents which is usually done a little before the dawn, the *Ñag-chang* burns some incense to please the *nága* demons who (are supposed to) live underground within the premises of her parents. These unseen beings are believed to be often attached to some individual member of a family so as to follow them like a dog wherever they happen to go. It is the duty of the *Ñag-chang* to keep them back by the efficacy of his charms and prevent their following the bride to her husband's place.

The *su-mi* (the bridegroom's people who come to escort the bride) and *kyel-mi* (men who escort her to her husband's place), and the *bag-yog-ma* (female attendant of the bride), proceed to the altar of the household god of the family to take leave of him. They make three salutations to him each time taking their hats off.

Then coming out of the house they seat the bride on a stool placed at the door. A priest (of the Bon religion) now performs the ceremony of *yangûg* (invoking good luck) by reciting some mystic charms and walking round her from right to left in the manner of a *Bon* religious circumambulation. When this is done, a small arrow studded with five precious stones and with five scraps of silk of five colours attached to its pinnacle, is fixed on the neck of her dress, its point touching the top of her head-dress. She is then placed on the back of a pony and slowly led to her future home. The parents with tears in their eyes now come to bid her farewell, and present her with the auspicious scarf called *tashi-khatag*. They send the *kyel-chang* (farewell wine) to be served to her at a short distance from the gate of their residence.

The bridal party then proceeds towards the bridegroom's house, being heralded by what is called *ta-kar mi-kar* (a man in white

riding on a white horse). An amulet containing some mystic charms to protect her against evil influences and the evil spirits of the ten quarters, is now worn by the bride. This is considered very essential for her well-being at this time. When a bride proceeds to her future home unprovided with this indispensable safeguard she is sure to fall under the malignant influence of evil spirits. For during her journey from the place where the farewell wine is served, *i. e.*, where she parts company with her parents and friends, and the place where she is first received with what is called the *welcome-wine*, she is not accompanied by the guardian spirit either from her father's side or from the bridegroom's quarter. As soon as the bride approaches the house of the bridegroom, a second batch of *su-mi* (people sent to receive the bride), dividing themselves into three parties, wait at three different stages on the way to refresh her with the *welcome-wine*. At each of these places she stops a few minutes to receive the *welcome-wine* and the auspicious scarves.

As soon as the bridal party arrives at the gate of the bridegroom's house, his friends, fearing lest some evil spirits may have followed the bride from her father's place, make arrangements to drive them off. For this purpose they bring the devil's effigy made of cloth or barley, painted with coloured butter, and throw it on the ground before the bride. The *kyel-mi*, i. e., those who have come from her parents' house to escort her, here take offence at this demonstration of groundless fear on the part of the bridegroom's people. They keep a sharp eye on the man who throws the devil's effigy, and, if possible, catch him in the act and tear his clothes to pieces by way of punishment. They let him off on extracting from him the promise of the payment of a fine of two or three *srangs*. In their turn they now try to find fault with the arrangements made for the bride's reception. It is customary to hang a piece of long silk scarf from the top of the gate on the occasion of the arrival of the bride. The bridegroom's people let the scarf drop for a moment and then lift it up. The bride's friends try to catch it and take it away to the bride's parents in token of their triumph over the bridegroom's party. Then the officiating Tantrik priest recites a few benedictory verses, &c., describing the door, house, &c., of the bridegroom.

"Hail, self-existent Dharma! Let there be happiness to all living beings. The lintel of this door is yellow, being made of gold. The door-posts are cut out of blocks of turquoise. The sill is made of silver. The door frame is made of lapiz lazuli. Opening this auspicious door you find in it the repository of five kinds of precious things. Blessed are they who live in such a house. Let them enjoy long life without being troubled with sufferings and dangers. Prosperity be theirs, and let there be no limit to their wealth. O, happy couple! If you wish to

found a family you should first do homage to the three Holies (Buddha, Dharma, and Sangha). Secondly, you should extend your charity to the poor and the fallen. Thirdly, your compassion to all living beings should be unlimited. We come from our fatherland, the country of gems, to open the mines of five precious metals, and to plant the root of generation. We have come indeed to execute a high mission, so do not close the door against us. Open it that we may enter."

Then the mother of the bridegroom, dressed in her best apparel, with a tray containing the *dah-dar* and some barley flour mixed with butter, in her right hand, and with a jar full of milk in her left hand, comes to receive the bride and to present her with the *tashi-khatag* and *che-mar* (the buttered barley). The bride helped by two female attendants alights on a stool which is covered with a rug containing the figure of the *swastika*. She is conducted by her mother-in-law to the marriage altar, and seated to the left of the bridegroom.

The carpet on which they sit usually contains the figure of the *swastika* and the floor of the room is painted with a paste made of wheat-flour, and water. The bridal party consisting of the *kyel-mi* and the *su-mi* then enter the reception hall after tasting a little *che-mar* (buttered barley), at the threshold. The friends of the bridegroom sit in the left row, the seats on the right row being reserved for those who come on behalf of the bride's parents. A sumptuous dinner is served to them. In the meantime the friends and relations of the bridegroom come to offer their *tashi-khatag* (auspicious scarves) to the married couple, and to make presents to them. It is customary with them to supply the provisions necessary for the entertainment of the first day. On this occasion all the neighbours of the bridegroom also take part in the festivities and make presents of cloth, gold, silver, &c., with auspicious scarves according to their means and taste.

Music and singing are kept up throughout the day. Then when the auspicious hour of solemnizing the marriage arrives the *Ńag-chang* makes offerings to the gods, and gives a new name to the bride, connecting it in some manner with the name of her mother-in-law. When this is performed a small piece of wood, about six inches long, is held to the lips of the bridegroom. The bride now sits in front of her husband, and takes the other end of the wood between her lips.

In the meantime a tuft of wool is placed in the hands of the bridegroom who draws out the fibres to some length. The bride takes it from his hands and twists it into a thread. This is called the ceremony of the first work of harmonious union. Then the party of the bride separate from that of the bridegroom, and sitting in rows of seats facing each other sing repartee songs. When the festivities terminate the bridegroom dismisses the *kyel-mi* with suitable presents.

PART II.

Marriage Customs in Sikkim.

The marriage ceremony takes place generally a year after the acceptance of the *Ñag-chang* though it is not unusual with the rich to have it performed after six months when the parties to be united are of proper age. On this occasion too, the influence of the *Ashang* (maternal uncle) continues to be paramount. The party of the bridegroom entertains him with rich food and wine to obtain his final sanction to the marriage. The entertainment that is given to him is called *den-chúng*. The suitor, however poor he may be, must, at least, contribute a roast fowl to the dainty feast that is prepared for him.

The *bar-mi* (intermediators) settle the price of the bride with her parents, who say that the *gem* in question being very valuable cannot be parted with easily. At last the price is settled, which among the poor people of Tibet living in the frontier generally comes to a few score of *tankas* or *srangs*, according to the resources of the bridegroom. The *bar-mi* then take the permission of the bride's parents to appoint an auspicious day for celebrating the marriage ceremony. This done their duties are at an end.

The maternal uncles of the parties or their representatives now come forward to conduct the marriage as *dodag* (managers). In Sikkim and Bhutan the *dodags* are furnished by the respective parties with what is called *bar-zen* (the mediator's fee) usually estimated at ten per cent. of the price of the bride.

So long as the marriage is not completed, the position of the bridegroom is considered to be that of a suppliant beggar. In Tibet he is received with some consideration, but in Sikkim and Bhutan his position is far from being enviable. But as soon as the marriage is settled, and the price of the bride fixed, his maternal uncle begins to assume a position of equality with that of the bride's maternal uncle.

He cites the common saying. "*Da-va mé-na ñen mi-kyab.*" Where equality (of position) is wanting there should be no marriage.

The question now arises where should the two parties meet to conduct the wedding ceremony. The suitor's maternal uncle endeavours to have it done according to the old customs of the country at an intermediate place between the residences of the two parties, but the bride's party do not agree to this. At last the former yields to the latter, and the wedding takes place at the residence of the bride's parents.

On the day of marriage the *bar-mi* again meet for the definite settlement or payment of the price of the bride. They are paid the usual mediation fee of five *rupees* or *srang* from each side.

If the bride belongs to the higher class, *i. e.*, the nobility, she is

valued at 18 ponies (each pony being valued at Rs. 50), and a present of nine articles called the *gu-tshan* consisting of the following:—a gold *mohar*, eight ounces of silver, a silk robe, a matchlock, a robe of thick Tibetan serge, called *purug-go*, *khamar* (wrapper made of raw silk), *baborma* (a good milch cow with a calf), a silk scarf of superior quality.

The price of a bride among the middle class is estimated at 12 ponies and a present of five different articles.

In the case of the poor the price of a pony is estimated at 50 lbs. of butter. If it is understood that the bride will bring with her a male and female slave her price is raised by two ponies, and the entire carcass of a pig or sheep thrown in.

The value of a bride among the common people is fixed at four ponies with a present of three things called the *sum-tshan*.

According to the common saying of the country, the price of a bride is in fact due to the mother. In Tibet it is called *nu-rin* (the price of mother's milk). The mother does not personally accept it on any account, but when parents do receive it according to the usage of the country, it is understood that double the amount of the price received should be given to the bride as *peejong* (dowry). This dowry becomes *peema*—the personal property of the bride, and corresponds with what is called *stridhan* in India.

When the marriage takes place at an intermediate place, the provisions necessary for the entertainment are supplied by both the parties—the largest share being borne by the bridegroom. In Sikkim he is required to furnish what is called *shya-gyu*—the carcass of a bull slaughtered for the occasion. When the marriage takes place at the house of the bride's parents they entertain their relations, friends and neighbours for one whole day with rich dishes and *chang*. The wedding ceremony takes place at or before noon, when the *don-ñer* or *khalenpa* delivers a harangue to the assembled people—and invokes the gods and the spirits of the ten quarters.

A respectable man of the village, who is blessed with sons and daughters, and has means, is appointed to perform the *khalen* as follows:—"The three Holies (Buddha, Dharma and Saṅgha), the united body of the sainted Lamas, the spirits of the ten quarters, the guardian gods and defenders of Buddhism, the four great spirit kings, the snowy mountain Himalaya, the divine keepers of the sacred places and sites, the tutelary deities and guardian angels, and such other gods and spirits whom the parents of the bridegroom and bride propitiate, and ye celestial beings henceforth protect this married couple, named ——— and———. From this day he will be hers and she his. They will be mutually responsible to each other for their respective conduct.

"He will not allow her to be ravished, or seduced by another man, nor will she allow him to fall under the influence of another woman. He will not in any way deprive her of her personal properties, nor allow other men more or less powerful than himself to rob or purloin her personal effects. They are united together this day in our presence, and ye gods and saints bear witness to their wedding." To this the couple, seated by each other's side, nod assent when the *don-ñer* throws a fine white silk scarf called *tashi khadag* on their heads.

Then the relations and friends of the bride and bridegroom present them each with a silk scarf, and in terms of affection wish them a happy life. This ends the first stage of the marriage ceremony called *ñen*, marriage. Though the price of the bride has been paid, and the *khalen-pa* has announced the wedding to the public, yet the married couple are not permitted to enjoy the honeymoon until a year has expired, or till the festivity of *chang-thûng* (drinking) has been performed. During this time the bridegroom is required to make frequent visits to his father-in-law's house with fancy presents for his spouse. In fact, this is the period of courtship with Tibeten-speaking people. Among the agricultural tribes of Sikkim and Bhutan this period is called *dor-gyug* (the period of servitude). The common saying among them is that "a son-in-law, though he is not a slave, must serve his father-in-law and mother-in-law, for at least three years before he can enjoy the person of his bride." This term of three years in the case of the lower classes is counted from the time of *lóng-chang*. Among the higher classes betrothal, marriage and *chang-thûng* are all finished within a year. It is in the case of the middle classes that these ceremonies extend over two years. The period of *dor-gyug* among the humbler classes can be conveniently shortened by payment of money, or by the present of five varieties of articles to the bride's parents

Chang-thung (the festival of drinking).

This final ceremony of marriage generally takes place one year after the *ñen* (formal marriage). The bridegroom again sends two *bar-mi* to ascertain the wishes of the bride's parents regarding the time of *chang-thûng*. This is considered the most delicate part of the marriage business, or *behu bumoi lón joi* as it is called in Sikkim and Bhutan. The parents and friends of the bride try on the slightest pretence to postpone it indefinitely in order to extract more service from the bridegroom. The *bar-mi* therefore exert themselves with much tact and care to ensure success in inducing the bride's parents to agree to *chang-thûng*. This being arranged, they consult the astrologer to fix an auspicious day for commencing the festivities and to prepare the

bride's horoscope. The marriage hour called *bag-kar*, (the *marriage-star*) occurs only once in a month, so the day in which the auspicious hour falls is selected for the wedding.

The festivity of *chang-thûng* extends over six days, the entertainment of the first three days takes place in the house of the bride's parents, and that of the remaining three days in the bridegroom's place.

The first day of the festivity is called the *dóng-chang*, *i. e.*, the day of the first drinking, when the *don-ñer* again invokes the gods and spirits in the terms stated above. The second day of the festivity is called *chang-thûng-chenpo*, *i. e.*, the day of grand drinking when also the *khalen* is made with much warmth. As soon as the *don-ñer* finishes his harangue, the Tasí-kyi-Lama begins his work—the ritual of auspicious offerings to the gods and spirits. These offerings, called *tashi torma* are made of barley flour and wheat decorated with wafers made of coloured butter, in the shape of *chaityas* and fancy temple-like structures. With these the head of the bride is first touched and then they are thrown towards the spirits, who are supposed to have assembled in space at the exhortation of the Lama. The third day of the festivity is called *Chang-ser*, *i. e.*, the day of the golden drink.

On the evening before the *dóng-chang* the bridegroom's people proceed to fetch the bride. The party consists of one or two valets of the bridegroom, four or five of his relations, including the *Ashang* (maternal uncle) who generally performs the *rôle* of the best man, two or three men called the *na-thi* (guides of the bridal party), the *pag-ró* (bridesmaid) the *hhyûng bag-ko* (the maid of honour), the bride's page who carries the bride's jewellery, &c., and a number of servants. The bridegroom's valet performs the part of the thief (*kûn-chen*) which is considered a dishonorable and odious duty in the marriage affairs of these cis-Himalayan countries. The bridesmaid sits by the side of the bride and covers her lap with a piece of silken wrapper called the *pang-khep*. All these people who form the bridal party, are selected according to the directions supplied by the astrologer, and are supposed to be well-to-do people of good fortune. No widower, widow, or *tshang-nag-pa* (husband and wife, to whom no son has been born) or *rab-ché* (those who are barren) are ever allowed to join a bridal party.

In the morning preceding the day of *dóng-chang*, the order and arrangement of seats for the people coming from the bridegroom's house, and also for those belonging to the bride's parents are settled. The *sû-mi* come in the evening of that day, but the *kûn-chen* knowing how he will be dealt with by the bride's friends, loiters behind to seek for an opportunity to enter the house of the bride's parents in a secret manner. In his endeavour to do so he is assisted by the bridegroom, who having

been in the house of the bride's father, has become acquainted with every detail of it. The fencing round the house of the bride's parents is covered with the branches of thorny plants and nettles. Two additional fences are erected at some distance from the house for the purpose of stopping the *kûn-chen* and also to prevent his running away from the place.

Guards are stationed at each of these fences to watch the movements of the *kûn-chen* who nevertheless succeeds in entering the house either by scaling them, or by some kind of strategy. With the exception of the *pag-pon* and one or two of his respectable companions, the rest of the party are treated with sham contempt and mockery. When others are served with good *chang*, bad *chang*, refuse and coarse kind of food, intended for pigs, &c., are placed before them. These not unfrequently exchange sharp words with the female friends and companions of the bride, who sometimes in the way of joke, sometimes in earnest, seek an opportunity to annoy them. If they be a quiet sort of people they generally settle the sham difference with these women by a bribe called *mag-lóg* (the fee of defeat).

The *kûn-chen* in the dead of night, when all the guards are asleep, makes his way to the place of the bride's parents by either scaling the fences or breaking through them. He comes provided with a pair of leather, or felt boots, and some woollen, or thick sackcloth. On his arrival at the door of the house, he finds that it has been closed from within.

At this time the bridegroom tries all his resources to get him inside the house. He calls the *kûn-chen* by signs or by a whistle to enter the house by lifting up some of the loose planks of the floor from underneath the *hog-khang*, where pigs and cattle are kept. Sometimes he points out to him the weak part of the roof or a bamboo wall of the house through which a passage is possible. If possible the bridegroom quietly comes out of the house to help the *kûn-chen*. If the female relatives of the bride happen to be awake, they light torches called (*bag-zi*) to beat him. Some among them being friendly, or brought to his side by a bribe, try to extinguish the light. As soon as the *kûn-chen* enters the house he at once wraps himself up with all the clothes that he can get hold of therein. The women now come headed by the bride's sister to beat him with switches and thorny twigs in their hands. In spite of the help that he can obtain from those that are friendly to him, he gets a thorough beating. The more violent among the women beat him mercilessly, as if he were the real enemy of the bride. Unable to bear the beating the *kûn-chen* sometimes abuses them, and sometimes he falls on his knees to beg for forgiveness. Sometimes he feigns exhaustion, and

falling prostrate on the ground, salutes them saying, "O merciful ladies forgive me. I shall pay the *mag-lóg* (the fee of defeat)." If they do not beat him severely, he remains on the ground as motionless, or half dead, and does not pay the *mag-lóg*, and at the end appropriates to himself the articles of *mag-lóg* which the bridegroom gives him to compensate his supposed loss in the way of *mag-lóg*.

Sometimes the *kûn-chan* behaves very humbly towards the female friends of the bride, in consequence of which they treat him with less severity, but under no circumstance can he escape the beating altogether. In the morning of the first day of *chang-thûng* called the *dóng-chang*, he is placed in a conspicuous place in the reception-room, wrapped up in blankets and other thick stuffs.

Dóng-chang:—In the morning at about 8 o'clock, the guests consisting of the relations, friends, neighbours, &c., begin to assemble in the marriage hall. They bring with them each a basketful of *chang*, a bag of rice, and a potful of barley flour. Each guest, as he enters the hall, strikes the *kûn-chan* lightly with the switch kept there for the purpose. The *kûn-chan* expresses his pain in loud shrieks. Sometimes when wanton boys apply the switch freely to his body, he will rush at them furiously. When the *kûn-chan* goes out to attend the call of nature, he is surrounded by the female friends of the bride, and is forced to sit on a log of the tree called *sam-shing*, the raw bark of which produces a blister when it touches the skin. The log is covered with nettles and other thorny plants so as to look like a horse. If he can be made to sit on the wooden horse they will hoot him with shrieks and laughter. If he does not sit upon it they beat him with nettles till he enters the room.

Chang-thûng chenpo:—On the second day of the festivities the neighbours, friends and relations of the bride's parents are entertained with wine, rice, meat, &c. The guests headed by the chief priest of the village, called *Tashi-kyi Lama*, present their respective scarves, together with silver coins, clothes, metal utensils, and *tashi-kha-tag* to the bride and express their good wishes for her. Some among the guests, who are near and dear to the bride, will present her with two or more scarves, saying that they present this scarf, called the *kyider* (the scarf of happiness), that scarf, called *gadar* (the scarf of joy), to wish her gladness, and so on. The guests also make presents of *tang-dar*, *i. e.*, a scarf with a Tibetan *tanka* or a *rupee*, to the *pag-pon*, *i. e.*, the best man and the bridesmaid. As soon as the scarves and other presents are brought the *don-ñer* (receiver of guests) announces the name of each donor. The money presents are deposited in a silver pot kept for the purpose on a small table before the bride. Then some one from among the

bridegroom's friends acknowledges the presents, &c., by saying *thug-je che* (great mercy). At this time the *kûn-chan* remains in his solitary seat, but unmolested by anybody. Till midday he finds himself very solitary as no one talks to him or makes any fun with him. When the presentation of scarves and *tang-dar* is finished, the guests sit at dinner, and drink *chang* to their heart's content. After dinner the guests touch the *kûn-chan's* head with their sticks. Some beat him lightly with the switch. This is called *solgyab* (after-dinner beating).

The guests are served with *chang* and tea in the aftenoon when they again play the same kind of practical jokes with the *kûn-chan.* This is called the *chang-gyab* (beating after drinking). In the evening buttered tea is served to them with barley flour or parched Indian-corn. Again they beat the unfortunate *kûn-chan* lightly with their sticks. This is called after evening-tea beating. When he has quietly undergone these indignities, the women taking pity on him cease to beat him any more. They ask him to drink *chang.* Sometimes a wooden bucket filled with *chang* is given to him. A servant then hands over to him a china-cup called *yangtse* with which he draws wine from the bucket. Then a trayful of half-baked beef or fowl, mixed with red pepper and kitchen soot, is placed before him. The female friends of the bride again come to annoy him. This time, catching him by his ears they force a quantity of under-done beef into his mouth. Some make him drink *chang.* Then the principal guests sing some benedictory songs, and offering their prayers to the Buddhas and the Boddhisattvas, to bless the married couple, they return to their respective homes.

Chang-ser:—On the third day of the festival, called the *golden drinking*, the neighbours and relations of the bride's parents again assemble to a grand dinner and drinking, when large quantities of beef and pork are given to them to eat. Two or more oxen or pigs, that have been slaughtered on the previous day, are cooked in large cauldrons with red-pepper and salt. The beef and pork so prepared, are called *shya-gyu* and *sha-phag*, respectively. At midnight of the third day the *kûn-chan* runs away quietly. If the women can catch him while running away they give him a good beating, which is called *dol-ñon* (the beating before he escapes). It is for this reason that the mother of the bride takes especial care of him and secretly arranges for his flight. The *kûn-chan* having effected his escape, proceeds to the rest-house that has been especially erected for the bridal party midway and waits there. Here he changes his clothes and becomes transformed into a great man called the *ṭha-pon.* The bride's mother sends some wine, beef and rice for his refreshment.

When the festivities at the house of the bride's parents terminate,

the officiating Lámá makes offerings to the gods at the auspicious moments called the *du-tsi jor* (in *Sanskrit* Amṛita yoga), the moments called *chi-jor*, the conjunction of the malignant stars, being avoided.

The offerings are first applied to the heads of the bride's parents and then thrown away, generally at the junction of two roads. At the same auspicious time the bride sets off for her future home. The astrologer new furnishes instructions on the following points:—

1. In what direction the bride should first look on starting.
2. What food or thing she should taste on her arrival at her husband's house.
3. What should be the year of birth of the woman who dresses her hair.
4. To what work the bride should put her hands first.
5. What should be the year of birth of *pag-pon*, the best-man.
6. The name of the man, who should first serve the bride with food.
7. The name of the man who should conduct her to her husband's house.
8. What should be the colour of the horse to be used for her conveyance.
9. The colour of the cushion, on which she should sit on arriving at her husband's house.

The bridal party start early in the morning. The bride is now surrounded by her friends and female relations, who shed tears on parting with her. The *pag-pon* (best-man,) the bridesmaid, *khyûn-bag-ko*, and other attendants who form the *sû-mi*, take charge of her from her parents. Some of her father's relations and friends join the party to escort her safely to the bridegroom's house All the people who form the bridal party are called *kûn-don*. If the bridegroom's house be a day's journey distant the *kûn-don* halt at some convenient place midway for refreshment, where a tent or temporary shed has been erected for the purpose. At this time they are not allowed admission into any dwelling-house. It is believed that a malignant spirit called *dong-ser-geg* always walks before the bride, and those who fall in his way suffer all kinds of danger. It is for this reason that passers-by turn aside when they happen to come across a bridal party.

Here the *kún-chan*, now transformed into a great man, waits for the bridal party. He is called the *ṭha-pon* (hawk-chief), for having come out of the ordeal successfully, *i. e.*, having snatched away the bride from the midst of her parents and friends like a hawk. Here he becomes the leader of the party, his position being second only to that of the *pag-pon* (best-man).

In the meantime the bridegroom sends another party of *sû-mi* with

chang-gyûg (wine for welcoming) to receive the bridal party. These dividing themselves into three parties, wait on the way in three stages. They carry with them a number of bamboo bottles of boiled *chang*, and reeds for sucking the liquor from them, and one or two heavy loads of fermented *chang* (*mur-wa* beer). At each stage they burn incense to the gods in large quantities for the purpose of purifying the atmosphere and also to drive away the evil spirits.

The first division of *sû-mi*, that meet the bridal party midway inform the *ṭha-pon* of the health of the bridegroom and the arrangements for their reception, and the *ṭha-pon* in a short speech asks them to partake of the *welcoming wine* sent for their reception and refreshment. He first invokes the gods, &c., then drinks *chang*. The invocation consists of the following:—

"The highest reverence is due to the three Holies. The guardian deities and tutelary deities claim our adoration with precious objects. By the blessings of the Lámás and the kind advice and predictions of the Dákínís, angels that soar on high, we succeed in all our worldly undertakings. The secrets of our success are supplied by the tutelary deities, and the Dharmapálas protect us by driving away the evil spirits from our neighbourhood. Let all the dangers and accidents to life that await us be averted! Listen to our prayers, and in return for the service we have rendered to you grant us health, wealth and all that the married couple may be in need of. O extend your helping hands to them at all times!"

Those who wait at the second stage raise a bower of green branches and leaves of trees for receiving the bride. Here a fire is kept burning and water boiling in a large cauldron. This is called the *thab-so* (keeping of the hearth). A kid is kept tied to a post at the entrance of the bower. Two or three long bamboo bottles called *pâdûn*, filled with water and decorated with wreaths of flowers, are also kept outside the entrance of the bower. Here the bridal party is regaled with *chang* and tea.

The last place where the bridal party is given the most cordial welcome is the *tangra* (outer courtyard) of the bridegroom's house. Here a man waits with a wooden tray containing the *chang-ki yang-tse* (a large cup full of wine) on the brim of which are stuck five crumbs of buttered barley called the *yaga*, a quantity of *chemar* (butter and barley flour mixed together), and the *dah-dar* (arrow with the five-coloured flags at its pinnacle). The bridal party as they enter the courtyard touch the wine and other articles at the entrance.

In the bridegroom's house his mother makes the necessary arrangement for the reception of the bride and the *kûn-don* (bridal party). She

prepares the marriage-cake service, called the *ama-kha-don* (mother's first entertainment). This consists of cooked rice, buttered barley flour, a ball of butter, cakes and some fruits. In a separate vessel is kept the food intended for the bride, which she is to taste first according to the directions of the astrologer.

The *Tashi-kyi-Lámá*, who has constructed some fancy cakes painted with coloured butter for offering to the gods and the spirits of the ten quarters, now draws some mystic figures on a small table for the *yang-gûg* (invoking the goddess of luck and fortune). A priest with a sacred book in his arms stands behind the door to touch the head of the bride with it as she enters the room. He must not stay there after doing his work. The *pag-pon* will beat him with a stick if he finds the priest lurking there. The object of touching the head of the bride with a sacred book is to prevent any evil spirit that may have come with the bride from entering the house. If the priest fails to touch her he is severely punished. At this time a gun (generally a matchlock) is fired to frighten the evil spirit so that he may run away as quickly as possible.

Then the *kûn-don*, headed by the *pag-pon*, take their respective seats. The *Tashi-kyi-Lámá* sits at the top of the central row of seats. When they are served with tea and *chang*, the *ama-kha-don* is brought and placed before them. The *ṭha-pon* (who on the preceding day acted the part of the *kûn-chan* or thief) now dressed like a chief comes forward to address the assembly, on behalf of the mother of the bridegroom, and tells them that everything has been arranged according to the custom of the country, and that the *ama-kha-don* has been placed before them for their acceptance. Then the *don-ñer* (receiver of guests), as the representative of the father of the bridegroom, presenting compliments, inquires of the health of the *kûn-don* if they have not been much fatigued on account of the journey, the difficulty of passage and the want of bridges over the hill torrents, &c. The *pag-pon* replies to his queries in polite language. After some conversation and exchange of congratulations they begin to refresh themselves with tea and *chang*. Dainty dishes are served to them at noon, or a little after. This day is called the *dóng-chang* at the bridegroom's house. All the provisions required for the entertainment on this day are supplied by the sister and brother-in-law of the bridegroom. If they be poor the bridegroom's parents meet the expenses, The *ṭha-pon*, who while performing the part of the *kûn-chan* had suffered so many indignities from the hands of the bride's female friends, now receives his reward. He is furnished with presents in money, rice, barley flour, meat and *chang*.

On the second day of entertainment, which is called *chang-thûng-chenpo*, the relations and neighbours of the bridegroom assemble together when

a sumptuous dinner is served to them. Before touching the food, one of them invokes the gods, demi-gods, Buddhas, Boddhisattvas and the guardian spirits to protect the married couple. Then the *Tashi-kyi-Lama* recites the grace.

Marriage Customs, &c., of Ladak.

After the "betrothal" ceremony has been performed, a month or two is usually allowed to elapse before the wedding takes place, though sometimes a year or more passes between the time of betrothal and the time of marriage. When a day has been fixed for the marriage, the procedure is as follows :—On the day fixed, the relatives (*nien*) of the bride (*pakma*) assemble at the bride's house and those of the bridegroom (*pakphe*) at the bridegroom's house. At nightfall the bridegroom goes with five or seven of his friends (*ngiápa*) to the bride's house, he finds the outer door (*giázgho*) of the yard (*stara*) shut, and guarded by male relatives of the bride, he gives a few rupees to them, and they then allow him to enter, but when passing between this gate and the door leading into the house itself (*giázghoi nángkuk*) he is surrounded by the bride's female relatives, who pretend to be angry, and beat him with small sticks. To these also the bridegroom has to give a few rupees, and he is then allowed to enter the house. The bridegroom, with his friends, is then feasted by the bride's relatives, but the bride does not appear. Much *chang* drinking, music and dancing is indulged in, till about 1 or 2 o'clock the next morning, when the best-man (*ngiátheet-pa*) or (*ngiáthrit-pa*), accompanied by some of the older male relatives of the bridegroom, goes to the kitchen (*makhang*) in company with the parents and relatives of the bride. The bridegroom and the rest of his party do not go to the kitchen.

The guests take their seats in the kitchen, and each one puts his drinking cup (*norey*) on the ground in front of him, and *chang* is then handed round by a male relative of the bride's, accompanied by one of the female relatives, who has a stick in one hand. The latter takes up the cup of each guest in turn and fills it, and if the guest fail to drink freely, she beats him. This ceremony is called *nanchang*, or insistance *chang*. During this time a ceremony known as *thohloo* is taking place, it is enacted by two old men, one being a relative of the bride, and the other a relative of the bridegroom. First, the relative of the bride gets up and sings a sonnet in praise of the bridegroom ; the other old man must then get up and reply, by singing a similar sonnet in praise of the bride, after which the first man again sings. and so for two or three times ; if either singer fails to reply to the other, he has to give the other party a few rupees, or a goat, &c. At this time the bride's parents stretch a rope across the room, and on it they hang all the clothes, ornaments, &c., which constitute the trousseau of the bride, any cash there may be as a *dot* is counted and placed in a box. These clothes, &c., are called *raktak*. A list of the articles is then made out; it is called *zongeek*, and is carefully kept, as a record of all the fine things given on the occasion. The best-man then takes possession of the *raktak* and remarks that it is getting late, and that he would be glad if the bride could be made over to him.

The bride's relatives then protest that they don't know where the bride is, as her girl friends (*yátó-dzámo*) have hidden her. The best man has to give a few rupees to the *yátó-dzámo*, who then produce the bride, who is in a flood of tears (often genuine), and lead her up to her mother. The bride then embraces the feet

of her mother, father, brothers, and other relatives, after which the best-man puts on the bride's head a hat called "*sham skor-i-teebi*" (with very broad brim, fur lined underneath, and velvet covered above), and over that he fastens a "*khatak*" or scarf of salutation, and then the bride's mother's brother (*Azhang*) takes the bride upon his back and carries her out to the "*giázho*," where a horse is in waiting for her. The first to leave the bride's house is the *ngiátheet-pa* (best-man) who is followed by the *ngiápa* (bride's relatives), then comes the bridegroom's relatives, then comes the bride (*pakma*), who has not yet been seen or spoken to, on that day, by the bridegroom, and the rear is brought up by the bride's friends, musicians and spectators. As the wedding party passes by other villages, on its way to the bridegroom's house, the villagers come out with offerings of satoo, ghee, &c., called "*kalchor*." The *ngiothee-pa* touches these offerings and remits them, and gives a small present to the person bringing them.

On arrival at the bridegroom's house, the door is found open, and in front of it are some Lámás (priests).

The bridegroom and his party dismount, and beg the bride to dismount; she weeping all the time, refuses to do so, but eventually the bridegroom's friends give her a present of a horse or a rupee or two, according to their wealth, and she then dismounts. Bride and bridegroom then stand up in front of the Lámás, with clasped hands and bowed heads, and certain prayers are read. The prayer-book is held by a novice or Lámá of low rank, and the *Hlo-bon*, or head Lámá reads from it. While doing so, he holds in his left hand a bell (*treeloo*) and a small drum (*daroo*), and in his right hand, a sceptre (*dorjey*) and some grains of rice and barley. He rings the bell and sounds the drum with his left hand, and with the right he scatters the grain over the heads of the young couple. The bridal party then enter the bridegroom's house where they find two mystic signs, traced by the Lámás in barley or other grain, on the floor. On one of these the bride sits, and on the other the bridegroom.

Between them is placed a measure, filled with grain in which is an arrow standing up and having a small pinnacle of clarified butter affixed to its top. The bridegroom's mother then offers *chang* to the bride and bridegroom, after which a Lámá comes and sprinkles them with holy water. This completes the religious part of the ceremony. The bridegroom, with all the males of the party, then goes to another room where dancing and merriment takes place. The bride with all the women of the party remains behind. After remaining a while, watching the dancing, the bridegroom is permitted to retire and rejoin his bride. During the whole of the next day, the merriment is kept up, and in the afternoon the bride, dressed out in all her best, and wearing all the jewels she possesses, comes out with her husband and walks round to shew herself off. She has to dance with the ladies of the party, and the bridegroom with the men. Having done this, they are at liberty to retire. The feasting is kept up that night, and the next day the guests go off to their respective homes. For seven days, bride and bridegroom remain in their house, but on the eighth day they must start on a journey, to make their bow to all their relatives. Having performed this duty, they return to their home, and begin their ordinary married life.[1]

Then the bridegroom and the bride are seated on two square cushions placed side by side touching each other, and the wedding vow is solemnly

[1] *Captain Ramsay's* "*Western Tibetan Dictionary*," pp. 97 and 98.

administered to them. The bridegroom accepts the bride as his, and she accepts him as hers. To this the gods and the spirits of the ten quarters, the saints, Buddhas, &c., are all invoked to bear testimony. Then the *don-ñer* coming out of the wedding-hall loudly proclaims to all present on the occasion and assembled in the courtyard, that he (the bridegroom) born of such a family and such a tribe, is married to her (the bride) born of such a family and such a tribe and to this union the gods above, the *Nagas* below, *i. e.*, from their abodes in the nether world, and the spirits of the middle region, *i. e.*, atmosphere, bear witness.

When this is finished fresh *chang* is poured from a jug in two cups, and presented to the bride and bridegroom. As soon as they have taken a sip or two of this *chang*, the parents of the bridegroom lift their respective wine cups to their lips to drink, when the guests follow their example. At noon the *Tashi-kyi Lama*, who has been conducting certain religious service in an adjoining room, brings the auspicious offerings prepared for the gods to be touched by the married couple. He recites a few benedictory *mantras* in order to bless them, and then touches their heads with the offerings and the *dah-dar*. The bride reverentially receives the tray containing the offerings together with the *dah-dar* from the hands of the *Tashi-kyi Lama*, and places them on her lap. The offerings are carefully preserved, being placed on the altar of the household god. In the meantime the guests one by one come forward to present the *ba-dar*, *i. e.*, the auspicious scarf of marriage, each with a rupee in his hand, to the bridegroom, bride, and the principal members of the bridal party, headed by the *pag-pon*, the best-man, who gets the largest share of presents. On this occasion the *Tashi-kyi Lama* whose part resembles that of a *Purohit* in a Hindu marriage, is required to make the largest present to the best-man. It is therefore commonly said that religious men, *i. e.*, priests and Lamas, should not attend a marriage ceremony, they had better be present at a funeral ceremony (" *Lámá choipa-de-tsho pag-ma lan sar-mando mi shi sar-do* "); because in a funeral ceremony all the effects of the deceased go to the Lámá, whereas in a marriage ceremony, he has to make considerable presents, instead of receiving anything in return for his services.

After the presentation of *ba-dar*, the distribution of uncooked meat, rice, *chang*, &c., in the way of remuneration to those who took part in the marriage, takes place. When this is over the grand feast takes place.

The dinner is commenced with the *don-ñer* saying as follows:—

" According to the common saying of our country, on the occasion of birth, and that of giving a name to a child, drinking of wine is the chief entertainment, but in a marriage ceremony drinking alone is not sufficient. It must be supplemented by a feast of more substantial kind

than drinking," *i. e.*, a heavy dinner is essential to add to the merriment of a marriage. Then meat and rice are served in large quantities to all those present on the occasion. According to the common usage the largest share of meat is generally given to the best-man, next to him the *tha-pon's* claim is taken into consideration, inasmuch as they had taken the largest share of trouble in the marriage.

The last day of *chang-thung* called the *chang-ser*, the day of golden drink, is marked in Sikkim by music and dancing, which is kept up during the whole day. It is indeed a day of merriment and revelry. Bacchanalians are sung each time the party go to refresh themselves with *chang*. It is said that in ancient times the marriage festivities used to be kept up for nine days and nine nights, but in these degenerate times the moral merits of the human race having diminished, the festive period has been reduced to three days. Then at the last stage of revelry when they have drunk to their heart's content, they finish the dance of marriage, each pulling one another's ears, and disperse. The married couple then retire.

One year after the ceremony of *chang-thung*, the bridegroom with his wife visits his father-in-law's home. The ceremony observed on this occasion is called the *pag-lóg* (return of the bride to her father's place), when new presents are made to the married couple by the parents of the bride. This completes the marriage ceremonies of the Sikkimese.

V.—*Measurements of Cingalese Moormen and Tamils taken at Ceylon in November* 1892.—*By the* Hon'ble H. H. Risley, C.I.E.

The following measurements of the three most numerous and characteristic races of Ceylon were taken in accordance with my instructions, and under my supervision, by Civil Hospital Assistant, Babu Kumud Behari Samanta, whom the Asiatic Society deputed to accompany me for this purpose on a recent tour in Ceylon. The instruments used were those recommended by Dr. Paul Topinard; the methods followed and the measurements adopted were based upon his work "*Les Elements d'Anthropologie Générale*," and upon personal advice from him and Professor Flower of the British Museum. In a later number of the *Journal* I shall attempt to give some account of the races in question, and to indicate briefly the conclusions which the measurements seem to suggest.

Measurements of 56 *Tamils*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial numbers.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
1	Sevanan ...	Parayan	...	...	Tinnevally ... S. India.	30	830	1620	1577	830	1165	1242	105	179	139	77·6
2	Mutenchati	Wellale	...	...	do.	30	760	1740	1700	892	1267	1260	114	186	146	78·4
3	Podisen ...	Parayan	...	...	Trichinopoly S. India.	30	780	1590	1540	802	1140	1150	...	180	141	77·3
4	Paranti ...	do.	...	...	Dekoya ... Ceylon.	25	860	1754	1620	840	1210	1220	...	191	140	73·2
5	Palanu ...	do.	...	...	Tondaman ... S. India.	35	810	1740	1650	810	1228	1240	...	190	144	75·7
6	Pachiá ...	do.	...	...	Karangola Cote, S. India.	40	845	1778	1624	826	1178	1184	118	188	146	77·6
7	Punusami ...	do.	...	...	Warderkebil S. India.	27	835	1702	1594	824	1180	1196	111	187	146	78 0
8	Punusami ...	Agamboty	...	...	Madura ... S. India.	30	805	1676	1620	800	1200	1226	111	181	143	79·0
9	Handi ...	do.	...	...	do.	35	840	1834	1706	840	1220	1292	119	181	144	79·5
10	Chulan ...	Parayan	...	...	Puthucota ... S. India.	32	820	1765	1648	822	1204	1224	109	184	148	80·4
11	Armogom ...	Belálas...	...	...	Trichinopoly S. India.	40	810	1620	1524	842	1158	1194	107	187	139	74·2
12	Marugar ...	Parayan	...	...	Arkadu ... S. India.	28	830	1650	1560	770	1140	1191	103	191	139	72·7
13	Kulan ...	Sakilian	...	...	Alanedu ... S. India.	34	875	1834	1686	830	1228	1282	124	191	147	76·9
14	Kolanda ...	Edian ...	...	...	Maradachila S. India.	30	795	1624	1614	820	1200	1194	102	180	148	82·2
15	Kandrewal ...	Parayan	...	...	Trichinopoly S. India.	26	845	1774	1634	774	1186	1222	106	191	141	73·8
16	Peran ...	Perlén ...	...	...	Putekudu ... S India.	30	830	1776	1660	802	1212	1274	111	186	149	80·1
17	Luchman ...	do.	...	...	Trinevally ... S. India.	30	850	1720	1600	812	1174	1194	112	184	137	74·4
18	Fanini ...	Kalen ...	...	...	Onecote ... S. India.	25	810	1666	1546	776	1172	1164	95	181	145	80·1
19	Kalienti ...	Tamilta	...	...	Madras ... S. India.	40	830	1700	1626	834	1194	1210	110	184	144	78·2
20	Mutai ...	Sadia ...	...	...	Katpali ... S. India.	38	845	1782	1618	816	1186	1214	109	178	136	76·4
21	Kopendi ...	Palal ...	...	...	Chaigange ... S. India	30	835	1660	1532	756	1116	1146	98	176	138	78·4
22	Chowal ...	Pellé ...	...	...	Alangcote ... S. India.	30	815	1664	1588	774	1152	1196	94	173	147	84.9
23	Pararhé ...	Kalla ...	...	...	Konapati ... S. India.	25	835	1660	1600	810	1194	1210	106	189	142	75·1
24	Kisna Swami	Pellé ...	...	...	Tanjore ... S. India.	40	860	1672	1602	802	1186	1240	...	181	143	79·0
25	Sewsa Swami	Naran ...	...	...	Trichinopoly S. India.	25	880	1846	1700	846	1266	1280	...	190	139	73·1
26	Jaka ...	do. ...	...	...	Trinevally ... S. India.	35	860	1714	1570	798	1168	1172	...	190	134	70·5
27	Antom ...	do. ...	...	...	do.	40	845	1708	1668	872	1234	1238	...	192	164	85·4
28	Mute Swami	Pellé ...	...	...	Chowranda ... S. India.	35	845	1738	1690	858	1218	1258	112	189	150	79·3
29	Manike ...	Konar ...	...	...	Palechari ... S. India.	38	810	1668	1604	806	1168	1200	103	181	143	79·0

taken in Ceylon in November 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxilliary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxilliary-zygomatic index	Nasal height.	Nasal width.	Nasal index.	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersupercilliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
100	136	73·5	47	38	80·8	113	124	112·3	91	133	215	65	436	245	105	282	382
100	131	76·3	44	37	84·0	109	124	113·7	101	130	230	67	467	254	108	283	400
95	127	74·8	45	36	80·0	93	106	113·9	89	132	208	65	436	254	113	378	422
101	127	79·6	49	40	83·3	107	126	117·7	96	130	218	65	460	247	120	260	402
107	138	77·5	46	38	82·6	102	116	113·7	90	135	214	66	457	257	105	268	376
110	136	80·6	48	38	79·1	98	112	114·2	95	133	216	67	477	247	114	257	386
98	137	71·5	47	35	74·4	101	114	112·8	90	135	225	60	446	231	103	257	397
101	126	80·1	44	44	100·0	94	102	106·3	100	136	228	58	447	234	112	257	385
101	135	74·8	48	40	83·3	106	114	107·5	100	131	230	68	483	263	119	271	425
101	131	77·0	46	40	86·9	97	116	119·5	94	131	220	66	457	243	117	276	397
96	127	75·5	45	37	82·2	92	106	115·2	92	128	221	67	454	256	112	283	378
100	129	77·5	47	42	89·3	102	114	111·7	92	136	226	62	445	242	107	254	364
111	133	83·4	44	38	86·3	104	118	113·4	100	140	222	68	432	255	115	267	412
101	125	80·8	48	41	85·4	94	106	112·7	95	140	216	62	444	247	113	271	378
101	132	76·5	43	38	88·3	107	120	112·1	87	120	211	70	494	253	116	258	377
102	131	77·8	44	39	88·6	101	114	112·8	96	129	216	66	471	245	116	262	387
95	128	74·2	42	38	90·4	97	108	111·3	99	139	219	70	467	238	107	271	412
99	127	77·9	44	38	86·3	92	102	110·8	96	135	225	63	431	222	97	224	377
104	138	75·3	45	37	82·2	99	110	111·1	99	137	225	65	473	246	109	263	382
92	128	71·8	46	40	68·9	95	108	113·6	82	130	215	62	477	248	112	252	370
94	121	77·6	45	36	80·0	95	102	107·3	87	129	218	68	453	222	110	255	390
96	128	75·0	44	36	81·8	97	108	111·3	90	137	209	68	465	250	110	250	374
101	130	77·3	45	41	91·1	95	106	111·5	85	135	212	70	468	242	111	245	378
105	131	80·1	48	41	85·4	97	114	117·5	82	130	213	68	455	244	106	290	393
100	127	78·7	39	37	94·8	95	104	109·4	92	128	213	68	495	258	118	258	411
106	131	80·9	45	40	88·8	94	108	114·8	95	122	213	69	448	248	117	246	409
97	139	69·7	53	45	81·1	101	112	110·8	93	146	227	72	473	256	112	278	396
106	124	85·4	43	42	97·6	95	104	109·4	97	129	212	69	470	225	114	268	380
99	133	74·4	44	41	93·1	93	104	111·8	95	134	205	69	457	248	111	225	377

Measurements of 56 *Tamils*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial number.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
30	Beronuter ...	Parachadi	...	...	Peremboor ... S. India.	30	820	1688	1596	808	1176	1176	103	183	138	75·4
31	Kamde Swami	Hagam-badi.	...	...	Parencoti ... S. India.	38	862	1684	1628	836	1188	1188	113	188	152	80·8
32	Ramaswami	Agampota	...	...	Madura ... S. India	30	840	1666	1610	850	1176	1208	119	196	150	76·5
33	Tanti ...	do.	...	...	Madacheure S. India.	30	865	1800	1736	838	1270	1292	131	186	150	80·6
34	Mutoke ...	Ballálé	...	...	Puducota ... S. India.	30	870	1670	1372	802	1162	1152	121	188	147	78·1
35	Alege ...	Saikléal	...	...	Morde ... S. India.	40	720	1520	1502	744	1100	1136	92	179	139	77·6
36	Arlande ...	Parayan	...	...	Puducota ... S. India.	30	825	1732	1662	814	1226	1244	107	188	132	79·7
37	Rumandi ...	Kallem	...	...	Tanakamkelan S. India.	25	845	1674	1662	820	1212	1267	107	186	135	72·5
38	Mutsen ...	Naike ...	...	..	Palini ... S. Ind'a.	25	780	1694	1626	812	1192	1220	106	176	147	83·5
39	Chelle ...	Parayan	...	...	Tondapoti ... S. India.	40	740	1486	1500	750	1100	1152	100	179	185	75·4
40	Ochmali ...	Balu ...	...	...	Palancota ... S. India.	30	795	1668	1630	824	1194	1192	...	184	137	74·4
41	Ispodinada ...	Sanan ...	...	...	Bagbandi ... S. India.	30	820	1676	1644	760	1142	1142	...	190	132	64·9
42	Kapan ...	Pallan ...	...	...	Purtur ... S. India.	40	765	1538	1540	798	1150	1142	...	180	138	76·6
43	Towasi ...	Parayan	...	...	Palancota ... S. India.	35	820	1690	1612	798	1194	1198	...	191	143	74·8
44	Marian ...	do.	...	...	Trinevally ... S. India.	26	780	1700	1670	838	1238	1224	...	180	150	83·3
45	Ram Swami	Marapole	...	...	Wadakongeo-long S. India.	26	785	1668	1628	822	1182	1210	...	187	145	77·5
46	Sanial ...	Nara ..	...	...	Nagauari ... S. India.	28	790	1676	1604	834	1200	1206	...	176	140	79·5
47	Narmalinga	Bellálé ...	...	...	Colombo ... Ceylon.	26	770	1694	1676	818	1226	1254	...	180	145	78·3
48	Sonagalilum	Parayan	...	...	Trinevally ... S. India.	30	830	1670	1612	824	1178	1198	...	182	145	79·6
49	Ored ...	do.	...	...	do.	30	855	1768	1718	870	1248	1262	...	186	142	76·3
50	Sangleli ...	Sakli ...	...	...	Ravanagar ... Ceylon.	40	850	1874	1703	850	1236	1260	...	190	146	76·8
51	Ram Swami	Parayan	...	...	Palamcota ... S. India.	30	800	1700	1664	852	1252	1254	...	191	146	76·4
52	Sepan ...	Edayan	...	...	Trinevally ... S. India.	28	750	1551	1520	760	1112	1136	...	165	137	83·0
53	Kumar Swami	Bellálé	...	...	do.	28	800	1730	1640	830	1212	1210	...	185	153	82·7
54	Enapares ...	Nara ...	...	...	do.	35	830	1640	1620	846	1190	1192	...	182	141	77·4
55	Narain ...	Bellálé ...	...	...	Tanjore ... S. India.	30	750	1588	1560	788	1158	1158	...	181	146	80·6
56	Ram Swami	Rata ...	...	..	Trinevally ... S. India.	45	845	1870	1800	854	1290	1135	...	180	150	83·3
					Average ...		821·2	1696·2	1666·7	816·5	1191·9	1209·3	108·6	184·2	143·2	77·7

taken in Ceylon in November 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxillary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxillary-zygomatic index.	Nasal height.	Nasal width.	Nasal index.	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersuperciliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
91	127	71·6	45	36	80·0	94	106	112·7	89	130	212	64	463	250	110	267	394
105	136	77·2	45	44	97·7	99	110	111·1	91	136	220	67	462	255	113	267	390
110	134	82·0	46	40	86·9	100	108	108·0	90	134	220	69	456	252	114	272	374
116	141	82·2	47	42	89·3	101	112	110 8	103	142	235	67	505	263	127	278	401
108	135	80·5	49	38	77·5	103	112	108·7	96	125	229	60	462	244	111	274	378
96	123	78·0	43	39	90·6	92	108	117·3	90	124	206	67	426	223	100	226	338
111	131	84·7	47	36	76·5	91	100	109·8	100	138	221	68	462	246	116	257	383
96	125	76·0	45	38	84·4	98	108	110·2	102	129	222	61	442	241	103	242	406
105	127	82·6	42	35	83·3	99	108	109·0	97	134	210	65	460	247	112	250	362
95	121	77·8	41	38	92·6	97	106	109·2	86	124	198	65	412	242	105	252	342
101	131	77·0	43	43	100	94	104	110·6	85	125	225	65	471	249	114	261	379
106	129	82·1	47	36	76·5	96	106	110·3	80	136	211	73	457	239	109	258	382
87	121	71·9	41	42	102·4	97	106	109·2	90	123	208	64	443	236	112	256	363
107	135	79 3	48	41	85·4	95	106	111·5	94	120	218	68	370	257	113	249	389
96	131	73·2	48	38	79·1	98	108	110·2	88	130	218	63	462	248	108	261	387
100	131	76·6	42	37	88·0	96	106	110·4	84	127	207	67	455	245	106	259	368
94	123	76 4	45	41	91·1	90	98	108·8	80	126	209	66	454	241	117	232	381
102	132	77·2	49	37	75·5	101	108	106·9	91	120	212	66	468	250	114	243	349
98	130	75 3	45	40	88·8	96	106	110·4	92	129	215	70	465	243	112	250	404
107	130	82·3	49	37	75·5	97	104	107·2	85	135	226	66	498	262	116	279	408
111	135	82·2	53	44	83·0	105	116	110·4	90	130	233	69	505	267	112	275	403
104	131	79·3	50	34	68·0	94	110	116·9	100	147	217	57	470	250	118	255	374
88	123	71·5	44	40	90·9	85	100	117·6	94	134	210	63	428	226	101	224	346
100	132	75·7	48	38	79 1	97	106	109·2	84	140	218	68	469	223	105	238	392
99	131	75·5	50	35	70·0	98	112	114·2	87	134	223	65	451	246	111	258	386
97	125	77·6	49	38	77·5	93	100	107·5	87	121	213	63	437	229	105	240	369
109	133	81·9	51	36	70·5	99	100	111 1	100	120	231	62	518	279	115	260	407
101·0	128·3	78·7	45·9	38·5	83·8	97·6	108·8	111·4	92·0	131·4	217·5	65·9	459·9	245·9	110·4	260·6	385·2

Measurements of 22 Moormen

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial number.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
1	Aboobaker ... Sultan.	Moor ...	...	...	Colombo ...	35	870	1750	1660	864	1232	1216	...	191	148	77·4
2	Miski ...	do.	...	...	do	27	850	1726	1640	824	1202	1214	...	177	131	74·0
3	Mooralam ...	do.	...	...	do.	30	730	1544	1549	794	1200	1132	..	181	149	82·3
4	Shaíkh Mamu	do.	..	...	Tanjore ... S. India.	25	770	1656	1616	770	1178	1244	...	176	142	80·6
5	Takir ...	do.	...	...	Colombo ...	28	820	1712	1610	786	1162	1224	...	191	138	72·2
6	Shaíkh Jum	do.	...	...	do.	25	770	1754	1660	830	1220	1244	...	181	146	80·6
7	Shaíkh Katoun	do.	...	...	Tinnevally ... S India.	35	850	1852	1724	806	1246	1320	...	176	145	82·3
8	Sinon ...	do.	...	...	Colombo ...	26	770	1642	1604	720	1182	1210	...	181	149	82·3
9	Mandi Nayna	do.	...	...	Kalapore .. S. India.	25	830	1720	1642	854	1236	1236	...	188	140	74·4
10	Muhamad ...	do.	...	...	Colombo ...	25	790	1720	1680	850	1236	1250	...	182	142	78·0
11	Nather Shaheb.	do.	...	...	Salam ... S India.	40	840	1612	1584	320	1188	1182	...	184	143	77·7
12	Marasa ...	do.	...	...	Colombo ...	25	880	1736	1690	850	1232	1280	...	183	143	78 1
13	Adumi ...	do.	...	...	do.	25	770	1726	1674	816	1220	1264	...	176	140	79·5
14	Hyder Hosain	do.	...	...	Malabar ... S India.	35	840	1663	1580	804	1552	1170	...	193	133	68·9
15	Cuhí ...	do.	...	...	Colombo ...	26	800	1712	1694	842	1206	1222	...	177	142	80·2
16	Salema Cebe	do.	...	...	do.	25	720	1630	1574	790	1162	1182	...	178	144	80·8
17	Hosaini ...	do.	...	...	do.	30	880	1806	1684	846	1236	1284	...	193	150	77·7
18	Kasim ...	do.	...	...	do.	30	840	1654	1592	821	1178	1184	...	169	140	82·8
19	Saidahamid ..	do.	...	...	Tundi ... S. India.	35	860	1692	1550	812	1182	1196	...	186	150	80·6
20	Fakir ...	do.	...	...	Colombo ...	25	800	1650	1581	794	1153	1192	...	173	155	89·5
21	Abdool ...	do.	...	...	do.	26	860	1800	1752	874	1278	1306	...	182	153	83 6
22	Asonlobe ...	do.	...	...	Molialim ... S. India.	40	850	1622	1510	782	1134	1112	...	180	147	81·6
					Average ...		817·7	1699	1625	815·8	1200·6	1221	...	182·0	144	79·1

taken in Ceylon in November 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxillary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxillary-zygomatic index.	Nasal height.	Nasal width.	Nasal index.	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersuperciliary point.	Height from vertex to tergus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle fing of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
106	137	77·3	48	42	87·5	108	116	107·4	86	127	220	66	468	261	118	267	408
102	139	73·3	48	40	83·3	99	110	111·1	87	128	226	58	465	258	115	259	404
95	130	73·0	49	41	83·6	100	110	110·0	89	119	207	67	425	236	106	237	353
105	123	85·3	50	38	93·4	95	106	110·5	97	133	227	64	446	240	107	244	363
98	125	78·4	50	42	84·0	97	114	117·5	80	129	211	67	460	247	114	248	398
110	140	78·5	47	33	70·2	111	124	111·7	94	124	217	69	462	256	113	255	394
110	130	84·6	46	36	78·2	98	106	108·1	92	123	222	66	493	269	115	270	415
103	131	78·6	52	41	78·8	98	108	110·2	85	134	208	66	447	245	110	244	385
101	133	75·9	49	38	77·5	102	120	117·6	95	137	223	67	460	250	113	250	393
95	124	76·6	48	42	87·5	102	114	111·7	100	140	232	68	465	250	115	224	383
110	136	80·8	43	41	95·3	94	100	106·3	91	139	214	63	444	235	107	262	372
107	138	77·5	43	37	77·0	105	112	106·6	97	124	219	66	463	257	115	258	400
99	123	80·4	51	36	70·5	94	104	110·6	98	135	220	70	480	267	108	240	373
97	123	78·8	45	36	80·0	91	106	116·4	94	134	221	71	440	232	102	260	384
93	123	75·6	50	31	62·0	97	114	117·5	76	123	202	69	454	243	103	257	393
102	130	78·4	50	40	80·0	99	110	111·1	79	142	217	61	430	237	100	237	359
101	135	74·8	50	40	80·0	98	106	108·1	84	118	219	71	478	261	117	260	416
98	124	79·0	47	36	76·5	92	104	113·0	95	118	210	65	443	233	100	246	384
102	133	76·6	47	40	85·1	98	114	116·3	85	137	220	68	437	236	106	243	380
93	131	70·9	42	39	92·8	94	104	110·6	84	139	219	66	453	246	109	232	363
105	137	76·6	51	39	86·6	100	108	108·0	91	135	222	62	475	249	110	259	400
107	131	81·6	50	40	80·0	96	110	114·5	80	127	203	67	437	231	105	257	380
101·7	136·7	74·3	47·7	38·5	80·7	98·5	110	111·6	89·0	130·2	217·2	64·4	455·6	247·2	109·4	250·4	386·5

Measurement of 56 Singalese

1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	16	17
Serial number.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
1	Tegisapuhani	Goigomá		A	Colombo ...	45	820	1710	1667	880	1230	1220	...	185	148	80·0
2	Jusiapu ..	Káráve		B	Panadu ...	28	780	1620	1574	823	1165	1185	...	184	144	78·2
3	Adrian ...	Goigomá		C	Matra ...	30	850	1680	1661	886	1240	1240	...	191	145	75·9
4	Jakolis ...	do.		D	Colombo ...	30	850	1800	1710	873	1260	1270	...	185	143	77·2
5	Eliasappu ...	do.			do.	25	850	1740	1675	865	1228	1310	...	197	133	68·5
6	Charles ...	Nakati			Galle ...	28	810	1730	1668	870	1233	1300	...	183	145	79·2
7	Abranguapu	Goigomá		E	Colombo ...	42	850	1660	1620	869	1195	1220	...	183	140	76·5
8	Piris ...	do.			Abisawella ...	30	870	1790	1681	885	1850	1248	...	202	142	70·2
9	Somaranark	do.			Galle ...	42	800	1540	1595	857	1183	1190	...	179	152	84·9
10	Jonapu ...	do.		F	Colombo ...	25	820	1680	1660	845	1220	1240	...	173	150	86·7
11	Netorisa ...	Nakati		G	Tangal ...	28	810	1710	1713	890	1235	1290	...	171	136	79·5
12	Abiashami ...	Goigomá			Matara ...	35	770	1810	1709	844	1250	1270	...	178	145	81·4
13	Andris ...	do.		H	do.	35	800	1650	1591	845	1178	1190	...	183	148	80·8
14	Kirinaidé ...	do.		I	Colombo ...	35	825	1745	1700	844	1244	1255	...	187	146	79·1
15	Pudisinh ...	do.		J	do.	30	800	1600	1528	798	1146	1130	...	171	142	83·0
16	Seodoris ...	Radhare		K	Galle ...	25	760	1630	1610	806	1186	1198	...	182	150	82·4
17	Karalisano ...	Nowandan		L	Colombo ...	30	815	1678	1616	780	1180	1194	...	193	142	73·5
18	Batapu ...	Goigomá		M	do.	40	790	1712	1640	836	1200	1220	...	179	140	78·2
19	Devi ...	do.		N	do	30	875	1816	1712	896	1272	1254	...	185	153	82·7
20	Tonisapu ...	Alagamá		O	do	30	740	1658	1570	770	1154	1164	...	177	151	85·0
21	Sangalilam	Goigomá		P	do.	35	865	1770	1710	886	1276	1244	...	197	144	73·0
22	Konesperis ...	do			Ravanagar ...	32	830	1690	1576	772	1170	1170	...	191	139	72·9
23	Publish ...	do.			Colombo ...	25	785	1604	1563	800	1174	1122	...	182	138	75·8
24	Patusinh ...	do.		Q	do.	30	815	1748	1712	835	1268	1296	...	192	148	77·0
25	Indikapu ...	do.		D	do.	45	820	1608	1686	802	1160	1148	...	183	141	77·0
26	Antonis ...	Julam		R	do.	26	770	1700	1578	780	1170	1162	...	185	145	78 3
27	Aglis ...	Radhare		S	do.	30	790	1692	1604	803	1192	1221	...	176	147	83·5
28	Bhaudra ...	Goigomá		T	Kandy ...	25	790	1639	1624	840	1200	1223	...	196	146	75·0
29	Hemdikapu	do.		U	Colombo ...	30	780	1686	1583	780	1146	1164	...	180	134	74·4

Velátnárachigé. B Pálamándádige. C Senáráyekge. D Veerasingara.
I Lamanaidilagé. J Bolalisinhalegé. K Jairatmagé. L Indrabaragé.
Q Wanepu kangergé. R Tamolegé. S Khoratholegé.] T Disanegé.

taken in Ceylon in November 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxillary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxillary-zygomatic index.	Nasal height.	Nasal width.	Nasal index.	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersuperciliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
112	137	81·7	50	41	82·0	105	116	110·4	92	138	223	63	464	258	111	289	412
98	133	73·6	51	41	80·3	103	118	114·7	90	137	218	65	435	252	107	263	368
107	137	78·1	49	42	85·7	105	114	108·5	90	126	221	70	450	260	111	260	408
106	140	75·7	47	36	76·5	107	120	112·1	86	129	219	67	481	245	113	274	400
92	128	71·8	48	37	77·0	103	118	114·5	108	130	227	69	474	260	115	258	390
102	135	75·5	48	46	95·8	109	124	113·7	110	134	245	64	461	250	112	277	408
103	125	82·4	45	45	100	107	122	114·0	100	139	225	68	458	250	111	281	392
106	136	77·9	51	39	76·4	115	136	117·3	90	145	240	61	494	270	123	274	423
97	129	75·1	45	37	82·2	110	118	116·3	110	147	228	70	417	235	102	252	345
96	125	76·8	43	34	79·0	103	120	116·5	101	135	224	68	461	242	106	250	385
101	128	78·9	46	39	84·7	105	122	116·1	100	132	229	62	463	262	106	275	393
103	131	78 6	47	43	91·4	112	128	114 2	97	140	245	66	493	271	120	283	400
95	136	69·8	48	40	83 3	119	130	109·2	92	139	231	70	440	237	108	277	402
90	132	68·1	49	37	75·5	110	128	116·3	101	137	233	70	476	253	104	266	382
103	122	84·4	45	39	86·6	91	104	114·2	88	126	206	61	435	204	106	242	385
112	128	87·5	50	40	80·0	97	110	113·4	83	128	218	64	445	249	108	242	365
92	128	74·2	48	40	83 3	98	110	112·2	80	127	209	70	448	253	106	255	392
104	128	81·2	49	38	77·5	96	112	116·6	89	130	214	65	466	256	112	274	389
97	132	73·4	50	44	88 0	98	114	116·3	83	137	221	67	471	258	115	287	460
98	126	77·7	44	41	93·1	93	106	113·9	93	135	222	66	484	240	114	251	354
102	132	77·2	44	43	97·7	98	108	110·2	101	140	232	65	482	272	115	270	408
100	128	78·1	41	47	114·8	103	114	110·6	89	127	213	59	462	252	113	257	375
106	129	82·1	45	40	88·8	101	114	112·8	86	130	218	65	436	250	105	237	344
107	133	80·4	49	40	81·6	100	116	116·0	96	138	232	69	480	271	115	258	405
92	126	73·0	46	43	93·4	94	106	106·3	87	131	218	65	439	229	101	237	377
98	131	74·8	50	42	84·0	102	108	105·8	79	130	221	68	456	252	114	234	372
102	127	80 3	42	35	83·3	102	116	113·7	92	136	198	71	406	247	111	225	374
106	134	79·1	51	38	74·5	102	112	109·8	94	135	212	59	442	240	108	244	390
93	126	73·8	51	40	78·4	93	102	109·6	105	124	227	63	455	235	109	236	361

E Mankotakaukanamagé. F Wariapperunagé. G Nehuluagolalomlogé. H Koodagamagé.
M Waligomagé. N Eknaikegé. O Kaliperamagé. P Bisampereragé.
U Joygodiarachegé.

Measurements of 56 Singalese

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial number.	Name.	Caste.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
30	Charles ...	Goigomá		A	Galle ...	28	790	1741	1640	822	1212	1203	...	186	143	76·8
31	Karole ...	do.		B	do.	30	860	1726	1633	824	1208	1204	...	187	139	74·3
32	Juanith ...	do.			Colombo ...	45	830	1746	1624	704	1194	1222	...	186	142	76·
33	Mesti Gohem	Fishere			do.	40	780	1498	1538	824	1162	1152	...	178	145	81·4
34	Handi ...	Goigomá		C	Galle ...	25	800	1726	1642	834	1210	1232	...	187	155	82 8
35	Tinapu ...	do.			Colombo ...	45	740	1616	1530	784	1114	1082	...	183	145	79·2
36	Haramans ...	do.			Panadora ...	25	760	1680	1672	770	1132	1176	...	176	146	82·9
37	Peris ...	do.			Colombo ...	28	770	1690	1594	834	1184	1170	...	178	143	80·3
38	Habrilapu ...	do.		D	do.	30	720	1576	1546	782	1136	1146	...	172	140	81·3
39	Joanisam ...	Achare		E	do.	30	730	1710	1636	784	1192	1254	...	186	135	72·5
40	Josaf ...	Kara		F	do.	28	840	1750	1636	766	1180	1226	...	176	139	78·9
41	Kaloo Hami	Goigomá		G	Ratnapura ...	25	830	1654	1570	764	1154	1142	...	193	150	77·7
	Janus ...	Kara		H	Colombo ...	30	760	1684	1562	788	1132	1184	...	186	143	76 8
43	Panchu ... Mahatma.	Goigomá		I	Sapragoma ...	35	860	1750	1730	816	1260	1326	...	188	136	72·3
44	Lakobhanda	do.		J	do.	30	720	1692	1653	830	1210	1223	...	179	142	79·3
45	Arnulusapro	do.		K	Colombo ...	35	850	1700	1720	890	1254	1244	...	181	147	81·2
46	Pererah ...	do.		L	do.	30	740	1694	1614	843	1194	1213	...	187	140	74·8
	Jong ...	Halagama			do.	25	820	1640	1499	804	1124	1186	...	184	140	76·0
48	Leonis ...	Goigomá			do.	32	855	1786	1692	834	1230	1254	...	181	150	82·8
49	Harmanis ...	Kara			do.	32	840	1726	1640	840	1190	1196	...	185	142	76·7
50	Harmanis ...	Halagama			do.	40	760	1620	1616	832	1192	1210	...	178	154	865
51	Bramha ...	Goigomá		M	do.	35	800	1690	1572	804	1174	1160	...	186	151	81·1
52	Siapu ...	do.		N	do.	30	775	1610	1574	774	1130	1180	...	181	135	74·5
53	Arolese ...	Duráé			do.	25	805	1574	1548	816	1162	1142	...	180	141	78·3
54	Jonasapu ...	Goigomá		O	do.	30	820	1600	1548	832	1200	1186	...	186	146	78 4
55	Salu ...	Salo		P	do.	35	835	1710	1660	820	1220	1236	...	183	146	79·7
56	Andris ...	Goigomá		Q	do.	30	770	1610	1530	782	1150	1142	..	177	143	80·7
					Average ...		803·3	1683·6	1662·4	815·1	1205·4	1207·6	...	183·5	143·8	78·3

A Bikramakankage. B Mahatigama Acheregé. C Jotinondagé. D Muninarachege.
I Minikangé. J Bodhinaik—Dharmaalaukargé. K Thoodoobhitanege. L Fedibiacharegé.
Q Lokutetigé.

taken in Ceylon in November 1892.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Bi-maxillary or bi-goniac breadth.	Maximum bi-zygomatic breadth.	Maxillary-zygomatic index	Nasal height.	Nasal width.	Nasal index.	Binalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersuperciliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.	Maximum breadth of shoulders.
112	134	83·5	51	41	80·3	95	110	115·7	95	122	230	65	471	257	113	234	395
105	131	80·1	45	34	77·5	94	100	116·9	84	130	212	66	464	252	108	258	409
101	127	79·5	50	34	68·0	100	114	114·0	110	133	232	66	472	257	110	269	385
100	126	79·3	46	40	86·9	97	104	107·2	92	134	215	67	393	222	99	246	360
102	136	75·0	43	40	93·0	101	114	112·8	100	140	237	69	458	261	117	230	380
100	123	81·3	47	40	85·1	90	100	111·1	100	136	225	66	442	237	106	247	373
101	124	81·4	50	36	72·0	93	108	116·1	82	128	210	67	463	241	108	242	356
91	122	74·5	46	34	73·9	92	104	117·3	90	129	214	67	430	250	106	240	378
100	124	80·6	52	37	71·1	91	102	111·9	88	140	220	66	422	242	99	241	350
90	126	71·4	51	37	72·5	95	108	113·6	73	128	211	67	452	237	104	232	371
103	135	76·2	50	39	78·0	100	108	108 0	100	121	221	68	480	262	117	270	357
103	133	77·4	44	40	90·9	100	114	114·0	104	140	230	71	445	254	111	264	394
102	131	77·8	42	37	88·0	94	108	114·8	81	133	207	75	450	240	112	249	380
102	130	74·8	52	40	76·9	95	110	115·7	93	125	222	64	484	264	111	243	395
110	140	84·2	52	41	78·8	107	122	114 0	70	107	206	66	451	257	114	240	380
93	129	72·0	51	37	72·5	94	108	114·8	98	123	227	71	447	256	107	248	379
100	130	76·9	52	40	76·9	93	108	116·1	83	133	218	71	436	245	101	240	384
98	126	77·7	46	36	78·2	91	102	112·0	85	142	207	70	452	253	110	247	362
105	136	77·2	49	41	83·6	95	108	113·6	75	135	214	68	477	266	124	241	392
110	128	85·9	49	39	79·5	102	110	107·8	76	127	218	62	463	247	111	245	376
105	130	80·7	47	39	82·9	95	104	109·4	85	134	218	66	445	233	114	224	352
103	136	75·7	47	42	89·3	101	116	114·8	89	130	226	70	432	238	104	246	385
94	120	78·3	48	40	83·3	90	100	111·1	79	127	208	66	452	234	108	253	351
95	122	77·8	44	36	75·0	93	102	109·6	84	128	211	68	427	227	105	238	386
105	132	79·5	49	41	83·6	100	112	112·0	86	134	223	71	467	242	106	262	395
100	124	78·7	50	39	78 0	100	118	118·0	88	139	212	69	456	249	120	258	379
94	132	71·2	41	40	97·5	98	112	114·2	88	129	203	68	436	231	112	240	360
100·7	129·6	77·7	47·6	39·4	82·7	99·5	112·5	113·0	90·8	132·3	220·4	66·7	454·5	248·3	109·9	253.1	377·1

E Kepitagoleacherigé. F Wandaothadcogé. G Koshpatabatege. H Armandahevagé.
M Gange. N Eloatige. O Lunaracheregé. P Mangoregé.

Form I.

Measurements of 7 members of the Nagar Tribe

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial number.	Name.	Tribe.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolous.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.
1	Raja Sihandar Khan.	Nagar ...	...	...	Nagar ...	27	...	...	1640	...	...	...	...	180	142	78·8
2	Raja Khusru Khan.	do.	...	...	do	17	...	...	1634	...	...	...	...	185	144	77·8
3	Sultanali ...	do.	...	...	do.	23	...	...	1670	...	...	...	...	194	151	77·8
4	Mirzabeg ...	do.	...	..	do.	30	...	...	1690	...	...	...	...	190	142	74·7
5	Kasir ...	do.	...	...	do.	38	...	...	1652	...	...	...	...	198	142	71·7
6	Abdul Hosain	do.	...	..	do.	29	...	...	1646	...	...	...	...	191	143	74·8
7	Ahmadali ...	do.	...	...	do.	28	...	...	1606	...	...	...	...	197	143	72·5
					Average ...	.....	.....	.....	1648·2	.....	.....	.....	.....	190·7	143·8	75·4

Measurements of 9 members of the Hanza Tribe

1	Mahamed Reza	Hanza ...	...	...	Hanza ..	30	...	...	1750	...	...	...	...	200	165	82·5
2	Afiyat Khan...	do.	...	...	do.	22	...	...	1684	...	...	...	...	188	144	76·5
3	Sultan Mahomed.	do.	...	...	do.	37	...	...	1696	...	...	...	...	189	156	82·5
4	Zarvara Khan	do.	...	...	do.	32	...	...	1766	...	..	...	...	195	148	75·8
5	Darvesh ...	do.	...	...	do.	39	...	...	1648	...	...	...	...	195	151	77·4
6	Abdul ...	do.	...	...	do.	30	...	...	1800	...	...	...	...	200	156	78·0
7	Mahomed Ali	do.	...	...	do.	43	...	...	1674	...	...	...	...	181	152	83·9
8	Nazir Sha ...	do.	...	...	do.	36	...	...	1708	...	...	...	...	197	150	76·1
9	Abdu Faiz ...	do.	...	...	do.	30	...	...	1654	...	...	...	...	191	146	76·4
					Average ...	.....	.....	.....	1708·8	.....	.....	.....	.....	192·8	152·0	78·8

Measurements of 6 members of the Kafir Tribe

1	Chara ...	Kafir...	...	...	Baskal Valley ...	30	...	...	1730	...	...	...	...	199	150	75·3
2	Tong ...	do.	...	...	do.	26	...	...	1654	...	..	...	...	191	149	78·0
3	Kam ...	do.	...	...	Presungal Valley	22	...	...	1738	...	...	...	...	193	144	74·6
4	Kon ...	do.	...	...	Baskal Valley...	28	...	...	1686	...	...	...	...	194	160	82·4
5	Teuk ...	do.	...	...	Chitral Border	19	...	...	1660	...	...	...	...	196	152	77·5
6	Astaula ...	do.	...	...	Utsum Valley...	14	...	...	1560	...	...	...	...	195	143	73·3
					Average ...	.....	.....	.....	1671·3	.....	.....	.....	.....	194·6	149·6	76·9

taken at Calcutta.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Minimum frontal breadth.	Maximum bi-zygomatic breadth.	Fronto-zygomatic index.	Nasal height.	Nasal width.	Nasal index.	Binalar breadth.	Naso-Malar breadth.	Naso-malar index.	Height from vertex to intersuperciliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.
102	133	76·6	58	37	63·7	107	122	114·2	...	...	...	69	...	...	...	...
107	135	79·2	60	39	65·0	111	120	108·1	...	...	...	69	...	..	...	...
105	134	78·3	59	38	64·4	103	118	114·5	..	...	...	70	...	...	...	...
106	135	78·5	58	35	60·3	98	122	124·4	...	...	...	72	...	...	...	...
100	127	78·7	64	35	54·6	101	116	114·8	...	...	...	66	...	...	...	...
100	134	74·6	58	40	68·9	98	106	108·1	..	..	...	66	...	...	...	...
110	132	83·3	52	35	67·3	103	114	110·6	...	...	...	68	...	...	...	...
104·2	132·8	78·4	58·4	37·0	63·3	10·3	116·8	113·3	.....	.....	.....	68·5	.....	.....	.....	.....

taken at Calcutta.

113	144	78·4	62	40	64·5	114	136	119·2	...	...	...	76	...	...	...	...
100	131	76·3	53	38	71·6	105	122	116 1	...	...	...	63	...	...	...	...
105	142	73·9	55	40	72·7	111	128	115·3	...	...	...	65	...	...	...	...
111	144	77·0	54	38	70·3	112	130	116·0	...	...	...	71	...	...	...	...
111	144	77·0	51	38	74·5	104	118	113·4	...	...	...	72	...	...	...	...
116	145	80·0	52	40	76·9	111	124	112·6	...	...	...	68	...	...	...	...
109	138	78·9	52	37	71·1	110	122	110·9	...	...	...	62	...	...	...	...
104	135	77·0	50	37	74·0	110	120	109·0	...	...	...	67	...	...	...	...
105	136	77·2	50	39	78·0	104	114	109·6	...	...	...	77	...	...	...	...
108·2	139·8	77·3	53·2	38·5	72·3	109	123·7	113·4	.....	.....	.....	69	.....	.....	.. ...	.....

taken at Calcutta.

111	141	78·7	53	37	69·8	110	130	118·1	...	...	...	71	...	...	..	...
106	135	78·5	53	37	69·8	105	124	118 0	...	...	...	71	...	...	...	...
108	137	78·8	54	39	72·2	109	128	117·4	...	...	...	70	...	..	...	...
111	144	77.0	58	37	63·7	101	116	114·8	...	...	...	70	...	...	...	...
110	141	78·0	55	38	69·0	108	122	112·9	...	...	...	65	...	...	...	...
107	129	82·9	52	36	69·2	109	126	115·5	...	...	...	66	...	..	..	...
108·8	137·8	78·9	54·1	37·3	68·9	107·0	124·3	116·1	.....	.....	.....	68·8	.....	.....	.....	.....

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Modern Customs among the Bedouins of the Ḥaurán, edited and translated by Colonel H. S. Jarrett.

Introduction.

The following monograph in Arabic, treating of the customs of the Bedouin tribes that visit the Ḥaurán, or dwell there during a great part of the year, was sent to the Asiatic Society by the distinguished author of 'Arabia Deserta,' Mr. C. M. Doughty, from Italy in the spring of last year. The letter accompanying the communication thus explains the origin and expresses the interesting character of the manuscript illustrative of customs of which details so circumstantial and exact are rarely within the opportunities of ordinary travellers to observe.

Villa Meglia, San Remo.

I have procured that a Lebanon Arabic school teacher, who was many years stationed in the Ḥaurán, beyond Jordan, and who in that time was much with the nomad tribesmen, should write an account from his own observation of the customs of those Bedawin, and from his own (Syrian) point of view. He knows no other than the Arabic language. The result is a manuscript of about 40 pages in Arabic, which I should think will be found of considerable interest, especially if the text be printed with a translation. I consulted Professor Sprenger as to publishing it (he has not seen it). He responded it might be best to put myself in communication with you, as you have the means of publishing the original, and it might form an article in your *Journal*. I offer it therefore for your acceptance.

I am, dear Sir, Yours sincerely,

8th April, 1892. Chas. M. Doughty.

However honourable to the writer of this lively sketch may be the industry and powers of observation it displays, its style and accuracy in point of language are scarcely creditable to the *schoolmaster.* Gray, writing to Horace Walpole regarding Boswell's *Journal of a Tour to Corsica*, which had not long before been published says: 'The pamphlet proves what I have always maintained, that any fool may write a most valuable book by chance, if he will only tell us what he heard and saw with veracity." This opinion toned down in the politer phraseology in which Walpole subsequently expressed it, cannot fairly be resented by any writer to whom it may be applied. 'Mr. Gray, the poet has often observed to me, that if any person were to form a book of what he had seen and heard, it must, in whatever hands, prove a most useful and entertaining one." As there is no reason to doubt the veracity of the following narrative, its value as a description of modern life among a historic race, lingering for centuries on the fringe of civilization yet untouched by it and still associated with the romance of desert chivalry, should need no literary ability to recommend it. This it certainly does not possess. As will be seen from the numerous foot-notes to the text, the solecisms are frequent and though the constant repetitions of phrase, wearisome without lucidity, savour of the school-room, the gross deviations from grammatical rules suggest that the educational staff of the province is itself in need of the training it professes to supply. This fault is, however, common, as Palgrave tells us, at the present day not only in Ḥijáz and Yemen, but more marked in Egypt and Syria, and most at Baghdad and Mauṣil, where the current speech is defective, clipped and corrupted in desinence, accent and phraseology. This is not due to dialectic change but to absolute degeneracy in form and character, noticeable in the meagre and artificial elocution of even those sufficiently educated to avoid the low provincialisms and errors of the illiterate. As a contrast to this base and degraded speech, he notices the pure well of Arabic undefiled that pours spontaneously from the lips of ragged urchins throughout Jabal Shomer and in the uplands of the Nejd country, as correct in expression as any rhythmical challenge of war or dirge of grief chanted in the desert in the Time of Ignorance. It is not to be expected that the language of Shanfara and Nábigha, of Imrul' Ḳais and Labíd, of men whose verse and ordinary speech were identical in substance if not in form, and who 'lisped in numbers, for the numbers came,' is to be found even among the Bedouins of the Decapolis, much less in the mouths of Syrian pedagogues of the Lebanon. Not a single instance, observes Lane, is said to be known of any individual's having acquired a perfect knowledge

of the grammar of classical Arabic, otherwise than by being bred among those who preserved it uncorrupt. Muḥammad himself was sent to the desert to be nursed by the tribe of Saad Ibn Bekr Ibn Hawázin, descendants of Muḍar though not in the direct line of the Ḳuraysh, and from this teaching he claimed to be the most chaste among the Arabs in speech. Even the famous lexicologist, Al Aṣmaʿi, and the equally famous grammarian his contemporary, Síbawaih, were reckoned by some purists to have erred in grammar. This classical language of Maad or Muḍar, as it is termed by the Arabs, is said to linger in some remote parts of Arabia. One of these is held to be Ạkád, near Zebíd on the western sea-board of El Yemen, the people of which suffer no stranger to remain with them more than three days, the prescribed legal period of hospitality, for fear of the corruption of their speech. The writer of this account has evidently not visited this fortunate spot even within the tolerated limits of a traveller's sojourn, but though his language fails to attain even the ordinary level of journalistic writing and its interest lies exclusively in its subject, there is nevertheless, in spite of grammatical defects, a simplicity of narrative which recommends it as the evidence of a straight-forward, unaffected, though not very intelligent eye-witness. Whether he has correctly quoted the two specimens of verse sung by the girls at the marriage-festivities is perhaps doubtful, and it would have been more to the utility of his description had he explained the meaning of the first of these which is much in need of a gloss. Its metre appears to be a rude form of *hazaj*, depending more upon accent than prosodial rule, resembling in its character the class of ballad first in vogue among the Umayyads of Spain about the ninth century, of which specimens are given by Ibn Khaldún in his Prolegomena. The province of Ḥaurán, situate on the frontiers of Iráḳ and Syria, is expressly mentioned by him as occupied by nomad Arabs who had roamed over its plains and continued to encamp there even in his day and who apparently still make it their annual pasturage. The province has given its name to the poems, or *Ḳaṣídas* composed by the Eastern Arabs which commonly begin with the name of the writer and pass on to the praise of the poet's mistress. These poems were termed *Badáwíyah* or Bedouin, and *Ḥauráníyah* or of Ḥaurán, and *Ḳaisíyah* after the tribe of Ḳais ordinarily dwelling in that country. They were chanted to some simple airs which paid little regard to the canons of harmony and were known as *Ḥauráníyah*. The Western Arabs styled this class of poems *Aṣmaʿiát* after Aṣmaʿi, the celebrated philologer and collector of the *disjecta membra poetarum*, who was a complete master of the idiom of the desert Arabs, and a living treasury of their verse, and who was said to have known by heart sixteen

thousand verses in the metre of *rajaz* alone. Ibn Khaldún has furnished us with an example of a poem of the Ḥauráni Bedouins composed by a woman whose husband had been assassinated, and who had sent this appeal through the tribe of Ḳais urging them to vengeance. It is written in the measure of *Ṭawíl* and follows, at a very long distance, the style of the ancient models. Such specimens, he observes, abound among the Bedouins and are transmitted as records of poetic distinction. Though some tribes affect this class of composition, he adds, it is disdained by others, such as those of Riyáḥ and Zughbah of the Bani Hilál and by the great tribe of Sulaym.

In my notes to the translation I have avoided any comment beyond a strict elucidation of the text, and I do not think it necessary to enter here into any general disquisition on the history or ethnography of the Bedouins. Such a course would be beyond the scope of this introduction to a writer who is the teller of his own tale which, as his personal testimony, is the only reason for its publication in this journal.

I have to express my acknowledgments to Mr. Rizḳu 'llah Ażzún the Professor of Arabic to the Board of Examiners, who has copied out and corrected the MS. for the press and assisted me with the benefit of his experience in determining the form and orthographical value of certain incorrect colloquialisms that occur in the text. The manuscript itself is clearly and neatly written, though the orthography is occasionally as little to the credit of the schoolmaster as his grammar. His deficiencies in this respect shall be concealed in the obscurity of his own language. I trust that his undoubted merits will not be unrecognized in mine.

H. S. Jarrett.

الخطبة

اولاً عند ما ينظر الشاب ابنة توافقه و يقع له ميل عندها يأخذ يتردّد على بيت اهلها و ياكل و يشرب في بعض الاحيان و بعض اوقات يكلفها بغسل رأسه و في تسريحهِ اي تمشيطهِ و يكونان الاثنين احراراً[1] في المعاشرة مع بعضهما بدون ادنى معارضة من اهلهما و انما بكل تلك المدة مع الحرية التامة بين الشاب والشابة يبقون[2] محافظين على حقوق الاداب والشرف و تلك العادة شبيهة بعوائد شعوب متمدنة - ثم بعد ان تقع المحبة في قلوب الاثنين وينظرون[3] بان ذوق الواحد قد وافق الآخر حينئذٍ يطلب الشاب من والده ان يخطب له تلك الابنة عندئذٍ ينهض الوالد بكل همةٍ و يدعو اوجه اوجه[4] عشيرتهِ و يمتطون ظهور خيولهم و يتوجهون الى بيت اب[5] الابنة فعند ما يقبلون على البيت ينتصب صاحب البيت مع من يكون حاضراً من اقاربهِ لملتقى ضيوفهم ويحولونهم عن خيولهم و يفرشون لهم احسن ما يوجد عندهم و على الفَور يحضرون الجلّة اي زبل البقر و بعر الجمال و يضرمون النار في وسط المقعد و يطبخون القهوة و يسكبون الى الضيوف ضمن فناجين في كل فنجان رشفة فقط فعندما ياخذ الفنجان كبيرهم يضعهُ قدامهُ و يقول لأب[6] الابنة لا نشرب قهوتك الاّ

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1 و يكون الاثنان حرّين

2 يبقيان

3 وينظران

4 This word is erroneously duplicated.

5 ابي

6 لأبي

وطنتيني[1] وهكذا يفعلون الجميع ارفاقهِ[2] من[3] ثمّ ينظر اليهم صاحب البيت اي أب[4] الابنة او واحد من اوجه عشيرتهِ و يقول لهم اشربوا قهوتكم فيصير على خاطركم — حينئذٍ يمسكون[5] كل واحد فنجانهُ و يشربون و في اثناء ذلك يكون صاحب البيت استحذر[6] على رأس غنم او ماعز ذبيحة و بعد ان يقطعوا اللحم شقفًا نحو نصف اوقية و يسلقوه في اللبن حتى يستوي و يضعونهُ على وجه المنسف من طبيخ البرغل الذي يكون نحو نصف مدّ وليس اقل او نحو خمسة الاف وستمائة درهم و يضعون ذلك المنسف في الوسط امام الضيوف و ياتون بنحو الفين[7] درهم سمن بارد و يضعونهُ على وجه المنسف فوق طبيخ البرغل و اللحم و يأتي الرجل من اقارب صاحب البيت و بيده ابريق ماء بارد و يغسل يد كل رجل من الضيوف غسلاً بسيطًا جدًا و ينظر الرجل صاحب البيت الى الضيوف و يقول افلحوا على الميسور اعني[8] تفضلوا على الزاد فيجيبونهُ لا ناكل من زادك الا تعطينا فاذا كان له ارادة في زيجة ابنتهُ[9] الى ابنهم يقول لهم تفضلوا و كلوا غداكم و كل ما تريدونهُ يجري على خاطركم حينئذٍ يتقدمون على الزاد و ياخذون يأكلون في اياديهم بدون ملاعق و خبز و عندهم عوائد البعض يكمشون قدر ما تحوش يدهم من الطبخ واللحم لربما ما ينوف[10] عن الستون[11] درهم

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1 تُنطيني for إنطى, تعطيني being a dialectic variety of إعطى in common colloquial use.

2 يفعل جميع رفاقهِ

3 The من better omitted.

4 ابو

5 يمسك

6 إستحضر

7 الفي

8 يعني

9 ابنتهِ

10 ينيف

11 الستين درهما

و يهندسها في يده على هيئة كرة و يردها الى فمهِ بدون ان يمسها في اليد الثانية و بدون لعوسة بل يكبسها كبسة واحدة في لسانهِ و يبلعها و بعد ان يشبعوا يمسحون ايادیهم في دفة البيت و من[1] ثمّ يمسحون ما بقي من اثر[2] الزفر في لحاهم و يرجعون بعد ذلک كل واحد الى مقعدهِ و يشربون القهوة مرة ثانية من[3] ثمّ ينظر ابو الخطيب[4] الى ابي الخطيبة[4] و يقول لهُ ابشر اجتک[5] يقول له ابو العريس ماذا تريد حقها يجيب ابو الابنة اريد خمسة عشر الف غرش بعد ذلک ينظر الحاضرون الى ابي العروس كلٌّ بمفردهِ مبتدئين من الاكبر سنًّا ماذا تفوت اكراما لخـــاطري يجيب ابو العروس اكرامًا لک اترك من حقي الف غرش من[6] ثمّ يخاطبون[7] الثاني بترك تسعمائة غرش و ايضا الثالة[8] يترك له ثمانمائة غرش وهلم جرا حتى يصل الى العادة والقانون الجاري بينهم نحو ستة الاف او سبعة و بعد هذه المحاورة ينهض ابو الخطيب على قدميهِ واقفًا و ابو الخطيبة كذلک و يلثم كل واحد شوارب الآخر ثم ينهضون واقفين جميع الحـــاضرين من اقارب العريس و العروس و ينظرون الى كلٍّ من ابي العريس و العروس و يقولون لهما مبارک مبارک حاجة العمر ثم يذبحون ذبيحة من كيس الخطيب و يطبخون عليها منسف برغل و يدعون جميع اقارب الابنة لاجل الغدا

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1 Omit. 2 أثر 3 Omit.

4 These two words should be reversed in order to be in harmony with the grammatical construction of the sentence.

5 For جاءتك a not uncommon colloquialism. The *alif* appears superfluous.

6 Omit. 7 يخاطبه 8 الثالث

وبعد هذا ينهضون[1] اهل العريس ويدعون عموم اهل العروس الى وليمة في بيت العريس فيركبون الطرفية من بيت الخطيبة و يذهبون سَويًّا[2] الى بيت الخطيب فيلاقونهم[3] اقارب العريس بكل ترحاب و بشاشة و يعملون لهم اكرام[4] لامزيد عليه و بعض الاغنياء يذبحون جزور[5] بمثل هكذا ظروف لربما ثمنه يكون نحو عشرون[6] ليرة و تبقى تلك الزيارة متبادلة بين الطرفين الى ان يكتب الكتاب بتمام الاقتران —

الزيجة

اولاً يرسل اهل العريس خبرًا الى اهل العروس انهُ في اليوم الفلاني نريد عروسنا و في اليوم المعيَّن يركب جمهور منهم خيولهم ناقلين الرماح و السيوف و يجهزون نحو عشرة بنات من اقارب العريس او من عشيرتهِ و يلبسون[7] احسن ملبوسهم[8] و يتزينون[9] في حلي من الفضة و من النحاس و يدهنون[10] شعورهم[11] من بول الابا عر اعني بول الجمال وبهذا السبب يصير لون الشعر مسقول[12] يلمع و يحضرون جمال[13] من احسن طروشهم و يلبّسون الجمال اشياء من اثواب حرير احمر واخضر واصفر و على جانبيهِ اي جانبي الجمل يعلقون شراريب مسبولة لحد الارض و يضعون في ظهر كل جمل مرتبة تسع اثنتين من البنات و يسمون تلك المرتبة حصرة و يضعون كل بنتين على جمل و كل جمل يقودهُ رجل فقير يأخذ نحو ستة

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1 ينهض — 2 سوبةً — 3 فيلاقيهم — 4 اكرامًا
5 جزورا — 6 عشرين — 7 يلبسن — 8 ملبوسهن — 9 ويتزيّنّ
10 ويدهنّ — 11 شعورهن — 12 مصقولا — 13 جمالا

غرش اجرته و بعد ان عمر الخيالة و الجمال المزينة تصير حاضرة يركبون الرجال ظهور خيولهم و البنات ظهور جمالهم[1] و يسيرون موكب[2] واحد[3] الرجال يلعبون على ظهور الخيل في الرمح و السيف و الواحد يطارد الآخر و البنات في الهوادج على ظهور الجمال يغنون[4] و يزلغطون[5] و غنا البنات على الغالب يكون هكذا

يا لله تبل الشاشي حتى نجوز عيشي

راعينا هودّ على الفور شرب من شخاخ الثور

والرجال لا تزال في الطراد والبنات في الغناء حتى يصلوا الى البيت اي بيت العروس و تاخذ الخيول تلعب قدام بيت العروس مقدار نصف ساعة و بعد ذلك تحوّل الرجال و البنات و يدخلون الى المحل الموجود[6] فيه العروس والبنات و الرجال يقعدون في محلٍّ آخر من[7] ثمّ يحضرون لهم الزاد على حسب عوائد هم اى منسف طبخ و لحم الى الرجال و شرحهُ الى البنات و العروس و بعد ما ياكلون تنهض البنات و ياخذون[8] العروس الى محلٍّ آخر خلآء و يصخنون[9] حلّةَ مآء و يغسلون[10] العروس و يلبسونها[11] ملبوس[12] من جوخ وحرير ويأتون[13] في[14] العروس في الغنآء هكذا

ميلي يا بنت الامير عريسک فارس الفرسان

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1 جمالهن	2 موكبا	3 واحدا	4 يغنين
5 و يزغرتن	6 الموجودة	7 Omit.	8 و ياخذن
9 و يسخنّ	10 و يغسلن	11 ويلبسنها	12 ملبوسًا
13 و يأتين	14 بـ		

ميلي يا بنت البدو جوزك[1] يذبح العدو
ميلي يا بنت العرب بعلك يقري للضيوف
ميلي يا بنت الموالي عريسك ابو زيد الهلالي

من ثم[2] تركب الرجال ظهور خيولهم و البنات ظهور الهوادج و يركّبون العروس بظهر هودج يكون مزين[3] و مميّز[4] في زينته عن باقي الهوادج و يكون معها ابنة من لزم العريس مثل اخته او ابنة اخته او ابنة عمّه او ابنة خاله او ابنة خالته و يمشون بالخيول و الهوادج موكب[5] واحد[6] الرجال تطارد[7] في ظهور الخيل والبنات تغني[8] في ظهور الهوادج و يسمون هذا الموكب فاردة اي عرسيّة و يبقون على هذه الطريقة الخيول تلعب و البنات تغني[9] حتى يقبلوا على بيت العريس و هناك يعملون ميدان[10] نحو ساعة و البنات تزاغط[11] وهي[12] بظهر الهوادج - و بعد ذلك تحول الرجال والبنات و يدخلون العروس الى بيت احدى[13] الجيران يكون لاقى العروس و عزمها الى بيته و يذبح الخرفان و يطبخ نحو ربع قنطار من البرغل و يملي[14] منسفين كبار[15] و يسكب السمن عليهما بكثرة و يضع منسف[16] قدام الرجال ومنسف[17] قدام العروس و البنات و بعد الفراغ من الاكل يحضر[18] من اقارب العريس و يضع بيده مقدار نصف بشلك قيمة غرش و نصف و يصرخ باعلى صوته خلف الله عليك يا فلان اي انهُ يذكر اسمهُ و يقول عساك تبقى

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1 Metathesis for زوجك
2 بعد
3 مزينا
4 مميزا
5 موكبا
6 واحدا
7 يتطاردون
8 يغنين
9 يغنين
10 ميدانا
11 يزغرتن
12 و هن
13 احد
14 و يملأ
15 كبيرين
16 منسفا
17 منسفا
18 Supply واحد

دائم[1] و هذا[2] نصف ليرة وحينئذٍ يتقدم كل رجل بمفردهِ من الحاضرين و يعطي ذلك الرجل نحو غرش او غرش ونصف و يصرخ بصوت عالي[3] خلف الله عليك يا فلان و هذا[4] ليرة و هكذا يتقدم واحد بعد الآخر على هذه الطريقة حتى لا يبقى ولا واحد ومن[5] ثم يتقدم[6] النساء و البنات ايضا و يدفعون[7] ليد الرجل قليلاً من الدراهم و ياخذ ينادي خلف الله عليك يا فلانة و هذا[8] نصف ليرة و هلم جرا حتى يخلص[9] جميع النساء و البنات و هذه العادة يسمونها نقوط[10] فكل ما يجمعونهُ من الدراهم لا يتجاوز ماية و خمسون[11] غرش[12] فبعد الخلاص من تلك العملية يضع ذلك الرجل الوكيل جميع الدراهم التي يكون جمعها ضمن فوطة و يسلمهم[13] الى العروس و هذه العادة تسمى عندهم شو باش اعني مساعدة الى العريس و غب الخلاص من تلك القضيّة ياخذون ان يجمعوا من الحطب و من الجلّة اى زبل المواشي و يضعون الحطب جميعهُ في وسط مرجة فسيحة و بعد غروب الشمس بنحو ساعة يجتمع الرجال اي العشيرة جميعهم مقلدين[14] في[15] اسلحة من فرودة قديمة محتوية بارود[16] و يشعلون الحطب الموجود في تلك الفسحة دفعة واحدة حتى تنظر اللهيب يعلو مقدار خمسة[17] او ستة[18] اذرع و من ثمّ[19] يقف الرجال الحاضرون على هيئة دائرة حول النار و يبتدئون في نغم هَوَلَج هَوَلَج هَوَلَج وهذه اللفظة يكررونها نحو اربعة[20] ساعات لا يزيدون عليهـــا

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1 دائما	2 وهذه	3 عال	4 وهذه
5 Omit.	6 تتقدم	7 ويدفعن	8 وهذه
9 تخلص	10 نقوطا	11 وخمسين	12 غرشا
13 ويسلمها	14 متقلدين	15 بـ	16 بارودا
17 خمس	18 ست	19 Omit.	20 اربع

حرف[1] واحد[2] البتة وتلك الحلقة تكون منظر[3] مبهج[4] جداً لان النار تكـــون كبيرة للغاية و الرجال واقفين حولها رجل بجانب الآخر الكتف على الكتف مقدمين رِجل اليمين الى الامام و رجل الشمال الى الوراء شبيه الجنود في مواقع الحرب و يضربون الكفين على بعضهم[5] على طريقة لا يقدر المتفرج ان يميز ان كانت ضربة واحدة او ضربات مختلفة اذ انهم ينـــزلون سوية و يطلعون سوّية و مع عظم عدد الرجال في تلك الحلقة لا يمكنك بان تنظر رجل[6] مقدمة عن رجل قيراط[7] واحد[8] كانهم دارسين[9] الهندسة و بعد انتظام هذه الحلقة يحضرون[10] نحو ثلاثة[11] او اربعة[12] من النساء و البنات من اقارب العريس لا بسين[13] افخر ما عندهم[14] من الثياب و الحلى و الفضة و في يد كل واحدة سيف ويدخلون[15] وسط تلك الدائرة ويبتدئون[16] يرقصون[17] ويلعبون[18] في السيف و يومئون[19] في[20] السيوف على الرجال المؤلّفة منهم تلك الحلقة كمن يريد ان يبطش بسيفهِ بعدوه فعندها تهيج الرجال كوحش ضاري[21] و يسحبون الفرودة المحشوة بالبارود و يقوصون[22] بين ارجل النساء والبنات الراقصات و يدوم الحال هكذا على هذا المنوال نحو اربعة[23] او خمس ساعات الرجال و النساء و البنات هائجين على بعضهم كجمال او حصن هائجة على بعضها و في اثناء تلك العملية تنظر العرق من اجسام الرجال

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1 حرفًا	2 واحدا	3 منظرا	4 مبهجا
5 بعضهما	6 رجلا	7 قيراطا	8 واحدا
9 دارسون	10 يحضر	11 ثلاث	12 اربع
13 لابسات	14 عندهن	15 ويدخلن	16 ويبتدئن
17 يرقصن	18 ويلعبن	19 و يومئن	20 بـ
21 ضارٍ	22 و يقوسون		23 اربع

و النساء الراقصات كمرزاب من الماء فبعد ان تحطّ قوتهم من جرى التعب يدخل رجل جليل القدر متقدم في السن الى وسط الحلقة المؤلفة من الرجال و يقول باعلى صوته عليكم جيرة عليكم جيرة يا شباب فعندئذٍ يتركون اللعب و الهيجان و ياخذون راحتهم و عندما[1] الى كفوف بعض الشبان فى اليوم الثاني ترى ان كفوفهم وارمة من عظم الضرب و بعض الاحيان ترى لون كفوفهم ازرق من عظم خبط الكفين على بعضهما و يبقون مدة طويلة لا يقدرون على لمس شئ بايديهم و بعد الانتهاء من تلك المشقة يجلسون على الارض فِرَقًا فِرَقًا و تتقدم[2] لهم القهوة التي تكون معدة لهم و بعد شرب القهوة ينصرفون كل واحدٍ الى بيتهِ من[3] ثمّ فى اليوم الثاني يجتمعون و يأتون الى[4] عند العريس بالغذاء و اطلاق البارود و يكون العريس قد استعد على فطور اكرامًا الى الشبان فبعد ان يفرغوا من الاكل و الشرب يرجعون الى الغذاء و الرقص النهار بتمامه و بعد ذلك يعملون عزيمة الى العريس فى الدور مقدار سبعة ايام الفطور عند واحد والغداء عند واحد و العشاء عند آخر و بعد السبعة ايام ينتهي الفرح -

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الضيافة

عند ما يقبل الضيف على بيت المعزب ينهـض صاحب البيت على قدميه و يغار[5] على الضيف يمسك سرع الفرس و يحول

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1 Supply تنظر 2 وتقدم 3 Omit. 4 Omit.

5 ويغير

الضيف و يربط فرسهُ و بكل سرعة يأتي باحسن ما يوجد عنده من المفروش و يفرشهُ ضمن الربعة قسم من البيت لا تسكنهُ الحريم و على الفور يشعل النار ويحذر [1] القهوة و يعمل بريق [2] قهوة و يقدم الى الضيف من [3] ثم الى الحاضرين و بعد القهوة يحذرون [4] شيء [5] من الزاد لاجل الضيف و بعد ان تأكل الضيوف يقدمون [6] على الزاد الباقي من فضلة الضيوف الحاضرين [7] من اقارب صاحب البيت و عند ما يعزمون صاحب البيت على ان يجلس معهم على الزاد يرفض ذلك و يقول ما يصير المعزّب رباح [8] افلحوا عني [9] تفضلوا فبعد ما ياكلون [10] جميع الحاضرين يتقدم المعزّب و ياكل من فضلة الطعام و في هذه الفطرة [11] تكون ذبحت الذبيحة و بعد وقتٍ و جيز يستحذرون [12] على طبخ البرغل و يسكبونه في منسف من نحاس او من خشب وسعه لا يكون اقل من ذراع و يضعون اللحم على وجه الطبخ قطعًا و يضعوا [13] على جانب المنسف لية الخاروف مع فخض [14] قدام الضيف و يسمون تلك اللحمة الكبيرة شذاة و قبل ان يحذروا [15] الطعام ياتون في [16] الماء لاجل غسل ايادي الضيوف من [17] ثم يضعون الطعام في الوسط و يأتون بالسمن الجامد و يضعونه على وجه المنسف و ينظر المعزب الى الضيف و يقول افلح يا ضيف على الميسور اعني [18] تفضل و يعزم الحاضرين ايضًا من

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1 و يحضر
2 ابريق
3 Omit.
4 يحضرون
5 شيئا
6 يقدم
7 الحاضرون
8 رباحا
9 اي
10 ياكل
11 الفترة
12 يستحضرون
13 و يضعون
14 فخذ
15 يحضروا
16 بـ
17 Omit.
18 يعني

اقاربه فيقدمون و يجلسون دائر المنسف و يبتدئون يدربلون درابيل في الكف اي انهم يكمشون من الطعام في اليد و يسقلونها على هيئة كرة آخذة طول[1] نوعاً و يضع الباهم تحتها و يقدمها الى فمهِ و يكبسها بلسانه و يبلعها بدون ادنى مضغ او لوك و لربما بعض الاحيان تكون دربية البعض نحو ستون[2] درهم[3] فاذا كان الحاضرون في تلك الوليمة جمهوراً لا يسعهم الجلوس على المنسف دفعةً واحدة يبقون منتظرين الى المكان الذي يخلو و كلما[4] فرغ مكان يسدهُ الآخر اي كل ما[5] قام واحد ياتي الآخر الى مكانهِ و هلمّ جرا حتى ياكلوا الجميع[6] و في اثناء ذلك اي في اثناء الاكل عند ما يخف السمن عن وجه الطعام يزيدونه و في بعض الاحيان تنظر السمن ينسكب مرزاب[7] من كفوف الاكلين و بعد ان يشبعوا جميع الحاضرين يقدم صاحب البيت و ياكل من آخر المنسف الذي لربما يصير قسم من الطعام الباقي و سخا من الايادي التي امتدت اليه و اذا بقي الضيف الى المساء يعطون عليق[8] الى فرسهِ و كذلك تتقدم[9] ذبيحة ثانية على العادة التي تقدم ذكرها و من جملةِ عوائد الضيف و هو على السفرة ياخذ من اللحم و يعطي كلاّ من الحاضرين الذين لم يجلسوا على الطعام من اول طورة[10] وايضاً عند ما يقوم واحد من الجالسين على الطعام يقول له المعزّب سدّ يا فلان على هذه الثنية و بعد الخلاص يقول الضيف لصاحب البيت يكثر خير المعزب مخلوفة في الحلال و في كل هذا الوقت عمل

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1 طولا
2 ستين
3 درهما
4 وكلما
5 كلما
6 جميعهم
7 مرزابا
8 عليقا
9 تقدم
10 طور

القهوة لا يبطل بل كل ما[1] خلص بريق[2] يجددن خلافه الى ان يسافر الضيف و في سفر الضيف من بيت معزبه ما زال على ملحة معزبه كلما يحصل له في طريقه من التعدي يقوم المعزب به و انما اذا ضاف في طريقه اخرين واكل من زادهم و بعده حصل له حادث وسُلب يصير حق السوال على المعزب الثاني و يسقط حق المعزب الاول - و حقوق المعزب على سالب ضيفه مرطبطة[3] بقوانين فاذا تصدّف سُلب الضيف باثناء سفره من بيت معزبه يركب المعزب و معه جمهور خيالة من اقاربه و من عشيرته و يذهبون الى الشيخ[4] عشيرة السالب و يقولون له مثلا فلان الفلاني كان ضيفنا في اليوم الفلاني وهو مسافر في الطريق و ملحتنا في بطنه اعني[5] اكل من زادنا و سافر و قبل انهُ اكل من زاد غيرنا اتاهُ فلان من عربكم في المكان الفلاني و عند ما اقبل عليه نسب عليه اى اخبرهُ انهُ كان ضيفًا عندنا و بعد تخبيره لهُ انهُ مسافر على ملحتنا سلبهُ والان نحن نريد حقنا - فيرسل شيخ عشيرة السالب وراء الرجل المتعدي و يحصل المسلوب منهُ تمامًا و يسلمهُ لصاحبه من[6] ثمّ يحصل من السالب حق المعزّب المتعدّى على ضيفه جمل[7] وناقة و عشرة روس غنم وسيف[8] و رمح[9] *

و اذا عشيرة السالب رفضت طلب معازيب الضيف وما دفعت لهم المسلوب من ضيفهم و ايضًا لم تدفع حق المعزب ينتج من ذلك حرب بين العشيرتين و بعض الاحيان يسفك دماء رجال كثيرين بهذا

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1 كلما
2 البريق
3 مرتبطة
4 شيخ
5 اي
6 Omit.
7 جمالا
8 وسيفا
9 ورمحا

السبب و من حقوق الضيف انهُ يسافر من عند معـــزبهِ مثل ما اتى لعنده و اذا بعض الاوقات سُرقت فرس الضيف من بيت معزبهِ او ماتت يلتزم المعزب يقدم فرس[1] لضيفه و خلاصة الامر وقار الضيف عند العرب و احترامه على جانب عظيم جداً و ذلك يدل على كرم النفس و الحمية و حب الشرف *

الحزن

العوائد في الموت * عند ما يموت رجل في العشيرة تحضر عموم رجال عشيرتهِ و اصحاب الخيول يركبون خيولهم و ينصبون ميدان طراد كانهم في ساحة الحرب و بعد مرور نصف ساعة تحوّل اصحاب الخيول وتربط خيولها و يدخلون على الميت و يضعونه على فراش و يضعون آلات حربه على جانبه والنساء يأتين[2] مزيّنات بافخر ملبوسهم[3] و في ايادیهم[4] السيوف و يبتدئون[5] في الرقص و لعب السيف و الغنى[6] مدة ستة[7] ساعات و بعد ذلك يذهبون الى الدفن و بعد ان يوارون[8] الميت التراب يرجعون رجالاً و نساءً الى بيت الميت و اذ ذاك تذبح الذبائح و يطبخ الطبيخ من كيس اهل الميت وتقدم[9] المناسف لجميع الحاضرين فبعد الخلاص من اكل الطعام تذهب الرجال الى بيوتها و تبقى النساء في بيت الميت مدة من سبعة ايام الى الاربعين يومًا و طول المدة تكون على حسب

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1 فرسا 2 يأتين 3 ملبوسهن 4 ايادیهن 5 و يبتدئن
6 و الغذاء 7 ست 8 يوارو 9 و تقدم

مقام الميت فاذا كان الرجل المتوفي[1] من اكابر القوم يكون البكاء و النويح عليه اربعون[2] يوماً و اذا كان من دون القوم تكون المدة سبعة ايام و في كل هذه المدة تلتزم[3] اهل الميت بتقديم الاكل و الشرب و القهوة و التتن في كل يوم ثلاث مرات لجميع النساء الحاضرات و بعد خلاص تلك المدة من واجبات اهل الميت ان يقدموا لكل امرأة لبسة اعني نوع[4] من الثياب مثل سلطة جوخ وكبر جوخ و شنبر حرير او حطة حرير او جزمة حمرآء و اذا تصدف ان الميت من الشيوخ او من الاغنياء لربما تكون كلفة القيمة التي تحضرها اهله بعض اوقاتٍ من اكل و شرب و قهوة و تتن و ملبوس تنوف عن مايةٍ وخمسون[5] ليرة ... و من جملة عوائدهم متى وصل خبر المتوفي[6] لعند[7] عشائر العربان المجاورة تحضر كل عشيرة لبيت الميت لاجل التعزية و يصحبون معهم ذبائح من الغنم او من المعزى و يسمون تلك الذبائح قيدة او مونسة و غب ما يبلغون الوصول الى بيت الميت تذبح كل الذبائح التي جلبوها على[8] آخر ذبيحة و تتقدم[9] الى المعزية على مناسف من طبخ البرغل و السمن فوقها كانه ماء من كثرته و الاكل يكون دربلة فى الايادي حسب عادة الفرح *

و من عوائدهم ايضًا ان النساء التي هم[10] من محرم المتوفي[11] اعني اللواتي هم[12] من لحمهِ و دمهِ مثل اختهِ و ابنتهِ و امراتهِ و نساء اخوتهِ

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1 المتوفى	2 اربعين	3 يلتزم	4 نوعا
5 وخمسين	6 المتوفى	7 Omit.	8 عن
9 تقدم	10 اللواتي هن	11 المتوفى	12 هن

و اعمامه يجرخون[1] خدودهم[2] باظافيرهم[3] حتى يخرج الدم و ايضا يخزقون[4] ثيابهم[5] و يضعون[6] التراب على رؤسهم[7] ومن جملة عوائدهم[8] ايضًا يرخون[9] شعور رؤسهم[10] على وجوههم[11] وعلى اكتافهم[12] و بعد مرور ستة اشهر تجتمع العشيرة رجال[13] و نساء الى بيت الميت و يقيمون مناحة مدة يوم و في آخر النهار يذهبون لزيارة القبر و هكذا يفعلون بعد تمام السنة *

و الذبيحة التي تذبح بعد موارات[14] الميت فى التراب تسمّى عندهم مؤنّسة الى المتوفي[15] *

في عوائد الغزو

الغزو عشائر من العربان تقاوم بعضها و عندما تقصد عشيرة تغزى[16] الاخرى يبتدي شيخ العربان بان ينبه على جميع عربانهِ قبل يوم الغزو بنحو ثلاثة ايام فحينئذٍ تحضر اوجه العربان الى بيت الشيخ فبعد ما يعمل لهم شروط الضيافة من ما كل و عليق خيولهم اذ ذاك يقول لهم يا وجه العرب قد اتاني خبر وكان اعني[17] حقيقة على ان العرب الفلانية هم موجودين[18] فى الارض الفلانية و ان ضمهم قليل جدًا ضمهم[19] اعني خيلهم ليست كثيرة و بعد ثلاثة ايام نريد نغزيهم[20] اعلموا جميع عربانكم ليجهزوا حالهم

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1 يجرحن	2 خدودهن	3 باظافيرهن	4 يخرقن
5 ثيابهن	6 و يضعن	7 روسهن	8 عوائدهن
9 يرخين	10 رؤوسهن	11 وجوهن	12 اكتافهن
13 رجالا	14 موارات	15 المتوفى	16 تغزو
17 اي	18 موجودون	19 ضمهم	20 نغزوهم

و في اليوم المعيّن تجتمع جميع الخيل فى الارض و المكان الفلاني فيركبون[1] اوجه العرب من عند شيخهم كل واحد الى فريقه و عند وصولهم الى بيوتهم كلٌّ منهم يجمع عربه و يعمل لهم ضيافة و بعد الضيافة يقول لهم نريد نغزى[2] العرب الفلانية في مكان كذا و يوم[3] الفلاني يجب تكون كامل الخيل مجتمعة جميعها فيذهبون كل الى بيته و كل خيال يلزم[4] بان يجهز ذهاب السفر من اكل و ماء لأجله و لاجل فرسه وما يلزم من الشعير لاكل فرسه ايضا و في اليوم المعين تلتقي تلك الخيول جميعها جمهور[5] واحد[6] و كل خيال محمل ذهابه على جمل و كل جمل قايده رجل مخصوص من اقارب صاحبه و تلك الجمال تسمى عندهم ركب[7] و يكون اخذ قيادة الجيوش جميعها شيخ عشيرة و كلهم ينقادون لامره فغب ان تتكامل الجموع يقول الشيخ انتم يا هل[8] الخيل اركبوا و انتم يا قادت[9] الركب اعني يا قادة الجمـــال اذهبوا الى الارض الفلانية و انتظروا الخيل هناك الى ان تاتي الخيـــل اليكم اذ ذاك تذهب الخيل قاصدة مواشي اضدادهم حيث تكون ترعى في البرية و الركب تذهب في المكان المعين لتكمن فيه - والان نرجع الى الخيل فعندما تصير على بعد مسافة ستة[10] او سبعة[11] ساعات عن منازل العربان اضدادهم تكمن جميع الخيل في بعض شعب و ينفرد منها نحو عشرة خيالة ولا يزالوا[12] سائرين حتى يصيروا على مقربة من بيوت العدو و هناك يكمنون النهار و الليل بطوله و في الصباح يلاحظون اي ناحية يتـــوجه

يلتزم 4	اليوم 3	نغزو 2	فيركب 1
اهل 8	ركبا 7	واحدا 9	جمهورا 5
يزالون 12	سبع 11	ست 10	قادة 9

الطرش مع رعيانه لاجل المرعى و حيث لابد في الصباح من تسريح المواشي الى البرية صحبة رعيانه فعندما ترى الخيالة الراقبة ان الطروش خرجت من البيوت قاصدة المرعى تركب تلك الخيول قاصدة كمين خيول عربانهم لاجل يخبرونهم[1] ان المواشي توجهت الى الجهة الفلانية اذ ذاك يركب العقيد اعني الشيخ و تركب جميع الخيول و يذهبون قاصدين الطرش و عندما يضعون ارجلهم في الركب يلفظون بعض كلمات (يا لله[2] يرزق العيال) و حال ما يقبلون على تلك المواشي على مسافة ساعة يشنون الغارة و يجمعون الطرش جميعه و ياخذونه في صدور خيولهم ولا يمضي الا القليل حتى يصل الخبر الى اصحاب المواشي اذ ذاك تركب جميع خيولهم طالبة تخليص حلالهم من يد الاعدا و بعض الاحيان يبقى طلب الخيل وراء الخيل يوما او اكثر حتى تدرك الخيل الخيل الاخرى و ينصب بين الطرفين ميزان الحرب و الطراد فاذا اخذت اصحاب المواشي الفوز و الانتصار تسترجع ما سلب لها من الجمال و الغنم و ترجع في الغناء و النشائد دلالة على الفوز و الغلبة فتلاقيهم حريمهم الى خارج البيوت بنحو ساعة في الزلاغيط[3] و الرقص ثم يرجع الكلام الى ما يتوقع في مدة الطراد و الحرب و ما عندهم من العوائد بمثل هكذا ظروف فاذا ادرك فارس فارسا آخر و ضربه برمحه او بسيفه و جندله عن ظهر جواده الى الارض يقول لراميه انا بجيرتك اعفي[4] عني عفى الله[5] عنك اذ ذاك

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1 ان يخبروهم 2 الله 3 الزغاريت 4 اعف
5 عفا

يحول الفارس المنتصر عن جواده و يكتف ذلك الرجل المرمي[1] و يسوقه قدامه ماشيا بعد ان ياخذ سلاحه و آلات حربه منه و يركب الفارس المنتصر على جواده و يقود جواد الاسير و رائه[2] حتى يبلـــغ الوصول الى عربانه و يبحش اي يحفر جودة في الارض قدام بيته عمقها نحو ذراع و يضع ذلك الرجل الاسير في تلك الحفرة و يطمه بقليل من التراب و يضع على فم الحفرة غطاء و مع كل ذلك تكون رجلي[3] الاسير مقيدة[4] بقيد من حديد و كل يوم يقدمون له شيء قليل[5] من الاكل و ايضا كل يوم يخرجونه من الحفرة مقدار ساعة لاجل قضاء حاجته كعادة الناس في بيت الماء و عند ما يذهب لخارج البيوت يكون مكتوف اليدين و حارسه رجل ناقل آلة حربه و بعد ان يخرج ما تحصل معه من القذار[6] في الجوف خارج البيوت يرجع وحارسه و رائه[7] و يضعه في الحفرة حسب العادة فبعض الاحيان يموت الاسير وهو على تلك الحالة و بعض الاحيان يشفقون عليه و يخلون سبيله و انما اذا صارت حرب ثانية فيما بين العشيرتين و وقع الرجل الذي كان مأسورا قبلا يقطعون رأسه حالا بدون شفقة البتة و من عوائدهم ايضا اذا ادرك فارس فارسا آخر بساحة القتال و وضعه تحت الضربة يقول له جيرني[8] اجارك الله و هذا عندي يوم من ايام العرب اذ ذاك يرفع الفارس المنتصر الضربة عن الفارس الذي طلب منه العفة[9] و يقول له الله احياك اذهب بسلام و هذا عندك يوم من ايام العرب

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1 المرمي
2 و راءه
3 رجلا
4 مقيدتين
5 شيئا قليلا
6 القذر
7 و راءه
8 اجرني
9 العفو

فاذا وقعت حرب ثانية بين العشيرتين و انتصر الفارس الذي كان مغلوبا المرة الاولى و وقع تحت يده الفارس الذي اعفى[1] عنه او احدى[2] اقاربه يعفي[3] عنهم ولا يضرهم بشئ و هذا يسمى عندهم جميل بجميل و انما الفخر للبادي من[4] ثم يرجع الكلام الى الركب اي الرجال الذي[5] تقدم الكلام عنهم قادة الجمال اللذين[6] كامنين[7] ومعهم الماء و الزاد و العليق للخيل منتظرين اقبال الخيل التي غارت على الغزو فالخيل سواء ان كانت كاسبة او غير كاسبة لابد لها ان تمر على الركب التي بانتظارهم فعند ما تقبل الخيل عليهم تركب قادة الجمال على جمالهم فاذا كانت خيلهم جالبة الكسب في صدرها و اصحاب المواشي لم يزل طالبة[8] و رائهم لاجل تخليص مواشيهم و الطراد قائم على العدو و في بعض الاحيان يكون انكسار القوم عن يد راكبين[9] الابل و اذا وصلت الخيل لعند[10] ركب الجمال خاسرين و ليس[11] ظافرين تمشي ركب الجمال مع الخيل سوية طالبين اهلهم و من عوائدهم ايضا اذا كانت الخيل راجعة من الغزو كاسبة غانمة و التقوا في رجل او في امرأة يبحر اعني ينظر ذلك الرجل عابر السبيل و تلك المرأة الى عقيد الخيل و يقول كوى[12] الرجل فيجيبه ذلك العقيد هلا[13] و رحب اذ ذاك يقول الرجل الى شيخ العرب اعني عقيد الخيل الحذية الحذية فحالا يامر له العقيد في[14] قسم من الكسب ان كان جمال[15] او غنم[16]

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1 عفا	2 احد	3 يعفو	4 Omit.
5 الذين	6 الذين	7 هم كامنون	8 لا يزالون طالبين
9 راكبي	10 عند	11 غير	12 كو
13 اهلا و رحبا	14 بـ	15 جمالا	16 غنما

و في بعض الاوقات يكون نصيب ذلك الرجل من جمل الى عشرة جمال على قدر ما يكون الكسب كثيرا او قليل[1] وهكذا من الغنم ايضا *

و من عوائدهم اذا تصدف ان ذلك الغزو ظفر فى الكسب و استخلصه و كانت تلك العصي اى الرعية التي سلبت من حلال رجل او اثنين و ليس من حلال العربان جميعهم تقوم جميع العربان بوجه العموم و ينظرون قدر الجمال التي سلبت و يجمعون من حلالهم بقدر ما سلبت و يعطونها لهم عيضة[2] عن جمالهم - و من عوائدهم يكون نصيب عقيد الغزو من الكسب بقدر خمسة من الفرسان و ما تبقى يقسم الكسب على الخيل و ركب الجمال سوية بدون تمييز رجل عن الاخر وهكذا كل عشيرة تمشي على هذه العوائد *

بعض قوانينهم الشرعية

ان القضاة عند العربان سدج لا يعرفون القراءة ولا الكتابة بل انما ياخذون وظيفة القضوية[3] بالارث خلف[4] عن سلف وهولاء القضاة يتفننون[5] في تحكيم الدعاوي بين المتخاصمين و يعطون كل ذي حق حقه و على ما اظن ان القضاة المتفننين[6] فى العلوم الفقهية لا يقدرون على ما يقدرون[7] عليه قضاة هؤلاء القوم المتوحشين وهاك بعض اخبار عن دعاوي[8] حكموا فيها عقليا و ليس عن كتب الشريعة : تصدف ان اخين[9] مقترنين فقراء[10] الحال[11]

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1 قليلا 2 عوضا 3 القضاء 4 خلفا 5 يتفننون 6 المتفننين

7 يقدر 8 دعاوٍ 9 اخوين 10 فقيري 11 كانا Supply

ساكنين في بيت واحد و بالصدفة ان نسائهما[1] ولدتا في يوم واحد الواحدة ولدت ذكر[2] و الاخرى ولدت انثى[3] و بينما ام الولد الذكر نائمة نهضت سلفتها ام الانثى و ذهبت الى فراش ام الولد و اخذت الولد من جانب امه و وضعت ابنتها مكانه و من عوائد العرب ان يلفوا الطفل اياما لا يشلحونه ثيابه و في مساء ذلك اليوم قدم رجالهما[4] من رعية الطرش فكل واحدة من النساء قالت لبعلها بشرى لك يا رجل رزقت غلام[5] فكون ام الولد الحقيقية تعرف ان سلفتها وضعت ابنة في الحال كشفت عن الولد الذي بجانبها فوجدته ابنتا[6] و ليس صبيا فاذ ذاك اخبرت بعلها باني انا وضعت الذكر و سلفتي وضعت الانثى و الان ارى امامي الانثى و بجانب سلفتي الذكر اذ ذاك انتشب الخصام بينهم حتى وصلت المسئلة لشيخ عشيرتهم فامرهما ذلك الشيخ ان يذهبوا الى القاضي ليقضي بينهم فتوجها الى القاضي و بسطا دعواهما فعندئذ صدر امر القاضي ان يحلب من ثدي كل من الامرأتين مقدارا بكيل مدقق و وضع ذلك الحليب مقابيل[7] بعضه في ميزان مدقق فرجح حليب ام الذكر على حليب ام الانثى مقدارا حينئذ خرج حكمه ان الحليب الاثقل وزنا هو الى ام الذكر و قال ايضا اذا كنتم لا تقبلون بهذا الحكم تحوجوني ان اجلب القملة ولا يخفى ان عند العرب قمل كثير[8] و قصده في القملة ان يضع كمية من حليب الذكر بصحن و يضع القملة في وسطه فلا تقدر القملة

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1 نساءهما 2 ذكرا 3 انثى 4 رجالهما

5 غلاما 6 ابنة 7 مقابل بعضهما 8 قملا كثيرا

ان تتخلص من حليب الذكر نظرا لوجود الصمغ فيه اكثر مما يوجد في حليب الانثى و انما اذا وضعت القملة في حليب الانثى تخرج منه بدون مشقة لعدم وجود المادة فيه و بعد هذا الحكم صار التحري والفحص المدقق فبان حقيقة ان الولد الذكر سرق من والدته و بعد هذا الحكم سلم الولد لامه الحقيقية و الابنة الى امها *

نبذة ثانية

رجل متزوج بامرأتين الواحدة عاقر و الثانية ليست بعاقر رزقت الامرأة التي ليست بعاقر ولد[1] و بهذا السبب صار الرجل يحب ام الولد اكثر من تلك فوقع روح الحسد عند الضرة و كمنت بقلبها ان لابد لي ان اميت هذا الولد و اخذت تترقب الفرص لتفعل هذا الفعل الردي فعندما ذهب[2] في وقت ما ام الولد خارج البيت لتلتقط جلة من البرية فهضت تلك الامرأة الشريرة و وضعت يدها على فم الطفل و انفه و اماتته فطيسا فعندما رجعت ام الولد الى البيت وجدت طفلها ميتا يعلو جسمه ازرقاق صرخت و ويلاى[3] لماذا فعلت معي هذا الفعل و انتشب الصياح بينهما و انتصر اهل كل امرأة لنجدتها و قوي الخصام بين الطرفين حتى توصل لدرجة الحرب بينهم فاذ ذاك حضر الامير و سكن الهيجان و امرهم ان يذهبوا الى[4] عند القاضي ليحكم بينهم فذهبوا و كل منهم صدر دعواه حينئذ طلب القاضي ام الولد على انفراد و قال لها انا اعرف ان ضرتك

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1 ولد 2 ذهبت 3 واويلاه 4 Omit.

الردية اماتت ابنك حسدا فالان اطلب منك شيء[1] اذا فعلتيه[2] احكم بدم انسان على ضرتك و اقاربها فقالت تلك الامرأة ماذا تطلب مني قال لها اذهبي الى راس الفريق اي بيوت العربان و اشلحي ثوبك ولفيه على راسك حتى تبان عورة جسمك لدى العربان جميعهم واذهبي من راس البيوت الى بيتنا هذا و انت بدون ستر على جسمك و بعد هذا العمل أخرج الحكم لك اجابته الامرأة لا يا مولاي لا افعل هذا اترك دم ابني الطفل و احفظ عرضي بين العربان لان عدمت ابني و اعدم عرضي ايضا لا افعل لا افعل لا افعل قال لها القاضي ادخلي و استريحي في بيت الحريم و استدعى الامرأة الثانية على انفراد و قال لها اطلب منك شيء[3] اذا فعلتيه[4] ابرك من هذه الجناية قالت له امرك ماذا تريد ان افعل اجابها يلزم ان تشلحي ثوبك و تلفيه على راسك كما اخبر ضرتها فعندها قالت الامرأة هذا شيء سهل افعله بكل رغبة فقط بشرط انك تبررني قال لها اذهبي الى راس البيوت و شمري ثوبك و اركضي بوسط العرب من هناك الى هنا كي الجميع يروا[5] عورتك و انا ابررك فذهبت اذ ذاك استدعى القاضي رجلا مهابا و قال له اذهب و راء هذه الامرأة الى رأس البيوت و عندما تنظرها رفعت ثوبها عن لحمها حالا البسها الثوب و امنعها و تعال بها الى ههنا ففعل الرجل كما أمر فبعد هذا كله حكم القاضي ان دم الولد يطلب من هذه الامرأة الردية فالبعض

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[1] شيئا [2] فعلته [3] شيئا [4] فعلته
[5] يرى الجميع

من اوجه العرب اعترضوا على القاضي كيف تحكم على هذه الامرأة بهذه الجناية بدون شهود اجابهم القاضي ان الامرأة التي تبيح عرضها و تكشف عورتها بدون حياء امام العربان جميعهم بلا شك تفعل هذا الفعل القبيح اجابوه ان حكمك بموقعه لا يرد و جرى قصاصها بالموت خنقا نظير ما فعلت يدها *

نبذة ثالثة

اشخاص اتهموا بقتل رجل و هو مسافر في طريقه و لكن لم يعرف من منهم الذي ارتكب هذه الجناية فاهل القتيل قاموا[1] الدعوى على خمسة اشخاص لعلمهم ان بينهم و بين المقتول ضغاين و لكن لم يقدروا ان يقولوا زيد قتل عمرا حقيقة فعندما امتثلوا لدى القاضي و فحص الفحص المدقق و جد جميعهم يبررون ذواتهم و حيث ان لم يوجد شهود لاثبات تلك الدعوى على واحد مخصوص امر القاضي انه بعد ستة اشهر اخرج الحكم على الجاني فبعد الستة اشهر طلب القاضي من امير العرب ان يجمع عموم العربان الى مرجة فسيحة و يضعهم رجل[2] بجانب رجل و اضعين ايديهم على صدورهم بهيئة صليب واخبرهم بصوت عال ان القاضي يريد يتكلم في اذانكم فيجب عليكم الاصغآء اذ ذاك تكلم القاضي في آذان الجميع قائلا اريد اتكلم كلمتين فقط فعندما افوه بهما كل من يبقى حافظ[3] يديه بهيئة صليب على صدره ياخذ من الامير جائزة فرس[4] و سيفا

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1 اقاموا 2 رجلا 3 حافظا 4 فرسا

و رمحا و قال أقبلتم على هذا الشرط اجابوا جميعهم نعم اذ ذاك وقف القاضي و الامير و اوجه العرب بجانبهما امام الجمهور المنتظم بالوقف و تكلم القاضي بصوت عال أيا عرب انا عرفت من طار عقاله عن راسه فهو قاتل ابن البدين اى اسم الرجل المقتول فقبل ان القاضي يطبق فمه و اذا برجل رفع يديه على راسه لامسا عقاله فتقدم الامير و القاضي و اوجه العرب و قبضوا على الرجل و بعد محاورة طويلة اقر ذلک الرجل بان يمينه سفكت دم ذلک المسكين *

عن الايمان

ان البدو يستعملون الحلف في احاديثهم كثيرا فلا يسردون جملة الا و يلفظون بالله و الله مرارا عديدة و صلوة محمد و يقسمون في هذه الالفاظ صادقون[1] ام كاذبون[2] لاخلاف عندهم اما الايمان[3] المعول عليه[4] عندهم و الذي[5] يستعملونه[6] في محا كماتهم و في قضاياهم المهمة هو هذا[7] (حق[8] العود و الرب المعبود و خطة سليمان ابن داود) و قبل شروع احدهم في هذا[9] اليمين يمسک عودا في يده و يرسم به دائرة على الارض امام الحاضرين و حينئذ يتلو هذا[10] اليمين امام اولائک[11] القوم الذين يكونوا[12] اذ ذاک شهودا عليه و عند حضورهم امام القاضي في دعاوي[13] مهمة و اوجب الأمر الى الحلف فيلقنه القاضي قائلا قل ايها البديوي و حق الخمس و الجواري

صادقين 1	كاذبين 2	اليمين 3	عليها 4
و التي 5	يستعملونها 6	فهي هذه 7	و حق 8
هذه 9	هذه 10	اولئک 11	يكونون 12	دعاوٍ 13

الكنس و الخضرآء و الغبرآء فبعد ان يلفظ هذه الكلمات امام الجمهور فيلتزم حينئذ بالغرامة و يقضى الأمر بدون معالجة ولا مما حكة و ايضا يستعملون غير الفاظ وهي و تربة[1] عيسى و موسى فهذه الاقوال الذي[2] يستعملونها فى الحلف و القسم و يتكلون على هذه الالفاظ في جميع معاملاتهم مع بعضهم البعض فيستدينون من بعضهم فيقتنع الداين من المديون فقط بالقسم بدون كتابات رسمية كما هي العوائد بين القوم المتمدن[3] و تراهم يصادقون بعضهم ولا يصير اختلاف الاماندر فسبحان من جعلهم يرتضون بهذه القوانين البسيطة *

تابع الجيزة[4]

فانهم بعد ما ينتهون من الرقص و السحجة و من كل ما ذكر سابقا يقوم العريس منتصبا على اقدامه و يهجم راكضا بسرعة بين النساء آخذا من يأتي بطريقه الى المكان الذي تكون فيه العروس فحينئذ يضرب العروس بعصاء[5] تكون بيده فيخدش راسها فيعتقد اذ ذاك بانه قد تسلط عليها و ما عادت تعصي له امر[6] ما دامها[7] في قيد الحياة و يوجد عادة اخرى وهو انه بعد ان ينتهون[8] من الغناء و الرقص حسب ما تقدم يوقفون العريس على باب الخبآء اي خبآء العروس و يتقدم من ورائه شابان قويان و يدفعونه[9] دفعة قوية فان سقط على وجهه يضحكون عليه ولا

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1 و تربة 2 التي 3 المتمدنين
4 Metathesis for الزيجة 5 بعصا 6 امرا
7 داما 8 ينتهوا 9 و يد فعانه

ياذنون له بالزواج تلك الليلة و الا اي ان لم يقع فينصرفون عنه الى بيوتهم ولا يبقى عنده الا اقاربه اللزم و حينئذ ينتهي كل شئ *

تابع الحزن

انهم بعد ان يعملون[1] فروض الحزن التي تقدم ذكرها يحملـــون الفقيد على الواح كما هي العادة بين الحضر و في مرورهم على الطريق عندما يصلون الى بيت يتظاهرون بانهم غير قادرين على المشي معتقدين بان الميت يجذبهم غصبا لناحية البيت الذي في طريقهم فيميلون اليه فحينئذ صاحب البيت يجلب للميت حطة او سلطة او عبـاه[2] حسب المتيسر و هكذا الحال من بيت الى بيت حتى وصولهم الى التربة و اذ ذاك يوارونه التراب و ينصرف كل واحد منهم الى بيته بعد ان يغسلوا ايديهم على القبر اي يمسك واحد من الحاضرين ابريقا و يتقدم الحاضرون واحد[3] فواحد على القبر و يغسلون ايديهم راحمين اياه و يعتقدون بان الروح لم تزل باقية في اذن الشمال و ان الميت يسمع كل ما يقال له من فروض الصلوة و غيرها *

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1 يعملوا 2 عباءة 3 واحدا فواحدا

MODERN CUSTOMS AMONG THE BEDOUINS OF THE ḤAURÁN.

Betrothal.

A young man seeks in the first place a suitable girl to whom he may pay his addresses. He then makes repeated visits to her father's tent where he occasionally eats and drinks and may at times impose on the girl the trouble of washing his head and combing his hair. Thus the two have free intercourse with each other without the slightest objection on the part of her people. But throughout the whole of this period, notwithstanding the complete freedom of intimacy between the youth and the girl, they scrupulously adhere to the injunctions of propriety and honour, following in this the custom of civilized communities. When their mutual attachment is assured and they are satisfied that there exists between them similarity of tastes, the youth requests his father to solicit her betrothal to him The father readily complies and invites the principal men of his tribe and they all mount their horses and proceed to the house of the girl's father who rises to meet them as they approach with the rest of his relatives that may be present. They are helped to dismount and the best carpets at hand are spread for them. Some cow-dung and camel-dung is now quickly brought and a fire kindled in the middle of the tent. Coffee is then prepared and poured out to the guests in cups, each cup containing but a sip. As the oldest among them takes a cup, he places it in front of him, saying to the girl's father, "We will not drink of thy coffee unless thou give her to me." The rest of his companions repeat the same thing in turn. The master of the house, *i. e.*, the father of the girl or one of the chief men of his tribe then addresses them, saying; "Drink your coffee and it shall be as you wish." Upon this, each one takes his cup and drinks it off. In the meanwhile the master of the house orders a sheep or a goat to be slaughtered, the flesh of which is cut into pieces of about half an ounce[1] weight each, and these are boiled in milk till they are thoroughly done and then placed in a large dish of *burghul*[2] not less in quantity

[1] An ounce, اوقيّة (from the Greek *οὐγγία* or *οὐγκία*) is one-twelfth of a *riṭl* or pound of twelve ounces; measured in *dirhams*, it was formerly equal to forty, but at the present day it varies in most cities: In Syria, according to the *Majáni 'l Adab*, the ounce equals 66⅔ dirhams.

[2] This is the name of the ordinary dinner of the Arab peasants. It consists of boiled wheat, dried and husked, prepared with fat or butter, and eaten with sour milk or meat.

than half a *mudd*[1] which is equivalent to a weight of five thousand six hundred *dirhams*.

This dish is set in the midst before the guests, and about two thousand *dirhams* weight[2] of cold clarified butter is brought and placed in the dish over the *burghul*. One of the relations of the master of the house then comes forward with a ewer of cold water in his hand and lightly washes the hand of each of the guests. The master of the house then turns to his guests and says to them, "Welcome to what has been provided," that is, "partake of the meal." They reply, "We will not eat of thy food unless thou give her to us," upon which, if he desires to give his daughter in marriage to their son, he rejoins, "Be pleased to eat your meal and it shall be as you wish." They then proceed to eat with their hands, using neither spoon nor bread. Some of their habits in eating are curious: for example a man will take as much meal and flesh-meat as the hand can grasp, probably more than sixty *dirhams* weight, and shape it into the form of a ball, and put it into his mouth without touching it with his other hand or masticating it, and catching it upon his tongue, at one mouthful swallow it whole.[3] When they are satisfied, they wipe their hands on the side of the tent and they clean whatever remains of grease there may be left, upon their beards. They then return to their seats and take coffee a second time. The father of the youth then turns to the girl's father who[4] says:—"Be happy, she is thine." On this the former asks what dower he demands for her. The girl's father answers, "I must

[1] There is a discrepancy in these weights. If the *mudd* be calculated at the ordinary dry measure of 1½ to 2 *riṭls*, half a *mudd* would be ridiculously little to place on a large dish before hungry Arabs. Taking the equivalent calculation of 5,600 dirhams, at 66⅔ to an ounce, it would give exactly seven *riṭls* or pounds of twelve ounces, which is perhaps a sufficient meal. Or taking 40 dirhams to the oz, the ancient weight, this would give 11⅔ as representing 5,600 dirhams. The *mudd* must therefore be an error in the text. In Syria and Egypt at the present day, 12 *mudds* are equal to 6½ kilogrammes, which would make a *mudd* = 1·2 of an English pound avoirdupois.

[2] Two and a half *riṭls* or pounds of 12 oz., but the *riṭl* varies somewhat. v. Lane. "Mod. Egypt.," p. 572.

[3] This manner of eating is at least as old as the 'Arabian Nights.' "Jawán the Kurdee stretched forth his hand to the dish, and it resembled the foot of a raven; and he ladled the rice with it, and took it forth resembling the foot of a camel. Then he compressed the handful into the form of a ball, so that it was like a great orange: he threw it rapidly into his mouth and it descended into his throat making a noise like thunder."—"Story of 'Ali Sher and Zumurrud." Lane. II. 413.

[4] The grammatical construction is here faulty. Either the positions of the fathers of the youth and girl must be inverted in the sentence or the relative pronoun introduced to give the sense of the passage.

have fifteen thousand piastres." Those present then address the father of the bride, one by one beginning with the oldest, saying, "What wilt thou deduct for my sake?" The bride's father replies, "For thy sake I abate of what is due to me, one thousand piastres." The next then requests him to lessen the sum by 900, and in the same way he abates 800 for the third, and so on until he reaches the customary amount according to the established usage among them.[1] When the conference is concluded, the bridegroom's father and the father of the bride rise and kiss each other on the moustache and such of the relatives of both families as may be present stand up and address the fathers of the bride and bridegroom saying, "May their union be blessed; may it be life long." An animal is then slaughtered at the expense of the bridegroom and a dish of *burghul* is prepared therewith and all the relatives of the bride are invited to partake of it. The bridegroom's party then rise to depart, inviting all the members of the bride's family to accompany them to a feast at the tent of the bridegroom. Both[2] parties then mount and proceed thither. The relatives of the bridegroom welcome them with expressions of delight and pleasure and receive them with all possible honour. Some wealthy man may also on such occasions slaughter a camel worth perhaps twenty gold pieces (*líras*). Both families continue to pay each other visits in this fashion till the marriage contract is duly signed.

Marriage.

The bridegroom's family first send word to the family of the bride informing them of the day on which they require the bride. On the appointed day a party of them mount their horses taking their spears and swords, and some ten girls of the bridegroom's family or of his relatives are decked out and dressed in their best apparel, wearing ornaments of silver or brass and having their hair dressed with camel's urine which gives a bright gloss to its colour.[3] And they choose the best of their camels and clothe them with silk trappings of red, green, and yellow, and from both sides of each camel long tassels hang reaching to the ground. Each camel likewise carries a seat accommodating

[1] According to Burton, this is usually about thirty Spanish dollars which were most prized in El Hejáz, in Yemen, the Maria Theresa. The Spanish Government refused to perpetuate its Pillar-dollars, at one time a great favourite in the East. The dollar was called Riyál Fransah. Mecca—III. 82. Edit. 1856.

[2] The word in the text is طرفية, probably a clerical error for الطرفين meaning الطرفان.

[3] Burton observes that the Bedouin hair becomes coarse from exposure, not a little increased by the بول الابل or wash alluded to in the text. The only *cosmetic* is clarified butter freely applied both to the body and the hair.

two girls, which they call *ḥaṣrah*. The girls are placed two and two on the camels each of which is led by a poor man who receives about six piastres for his hire. When all the horses and the caparisoned camels are ready, the men mount the horses and the girls their camels and they form a cavalcade, the men on horseback brandishing their swords and spears and feigning attacks on each other, while the girls on their litters on the backs of the camels sing with shrill screams of joy some such strain as the following[1]:—

* * * * * *

The men never cease attacking each other in mimic combat and the girls to sing till they reach the house of the bride. The horsemen continue their sports for the space of half an hour before the house, after which the men and girls dismount and enter the apartment which the bride occupies, but the girls[2] and men sit in another apartment where the customary food is brought to them, consisting of *burghul* and meat, and portions thereof for the girls and the bride. After the repast the girls rise and take the bride into a private apartment and heating a cauldron of water they bathe and dress her in garments of wool and silk and lead her forth singing as follows:—

Walk proudly, O daughter of the Emir,
Thy affianced is the first of horsemen.
Walk proudly, O daughter of the Bedouins,
Thy spouse is the slayer of his enemies.
Walk proudly, O daughter of the Arab,
Thy lord is hospitable to the stranger.
Walk proudly, O daughter of princes
Thy affianced is Abú Zayd al Hiláli.[3]

The men then mount their horses and the girls their litters, the bride being seated on one that is decorated and distinguished from the others by its ornamentation. She is accompanied by one of the bride-

[1] I leave the translation of these distiches, of which I can make no decent sense, to greater scholarship or ingenuity than mine. As the lines are not altogether cleanly, delicacy of language not being a point with Arabian ladies, the omission is not to be regretted. The metre is an irregular *Hazaj*. Some of the expressions I do not trace, and the character of the MS. provokes suspicion of its accuracy.

[2] It is probably meant that the girls and bride are in one apartment and the men in another but the construction will not grammatically admit of this.

[3] The exploits of this Admirable Crichton of the Bedouins, are chanted to this day by professional reciters in the coffee-houses of Cairo. See Lane, "Modern Egyptians," p. 394, for his adventurous history. An episode of this romance 'The Stealing of the Mare' has lately been translated from the Arabic by the accomplished Lady Anne Blunt and done into very graceful verse by her husband. Its completion by the same hands is much to be desired.

groom's female relations, his sister, his niece, or a cousin, and with the horses and litters a single cavalcade is formed. The men renew their mimic attacks, and the girls their song from the litters. This procession is styled *Fáridah*, and they thus proceed, the horsemen skirmishing and the women singing, till they reach the bridegroom's house when a tournament is held for the space of about an hour, which the girls from their brancards accompany with loud screams of joy.

When this is concluded the men and girls dismount and lead the bride to the house of some neighbour who has arranged previously to meet and invite her thither, and he causes some lambs to be killed and about a quarter of a *Ḳinṭár* [1] of *burghul* to be prepared. Two large dishes are filled, and a quantity of clarified butter poured over them and one dish is placed before the men and the other before the bride and the women. When the repast is over, a relation of the bridegroom places in the neighbour's hand half a *beshlik*,[2] equivalent in value to a piastre and a half, upon which he calls out with a loud voice, "May God reward thee for this, O such a one," mentioning his name and adding, "may you live for ever—this is half a *líra*."[3] Upon this every one present comes forward one by one and gives the man a piastre, or a piastre and a half, and he exclaims in a loud voice, "May God reward thee for this, O such a one! this is a *líra*," and thus they continue one after another in this manner until not a single person is omitted. After this, the women and the girls advance likewise and put into the man's hand a few *dirhams*, upon which he exclaims, "May God reward thee, O such a one, this is half a *líra*," and so on until all the women and girls have passed. This custom they call *nuḳúṭ*.[4] The whole sum collected does not exceed one hundred and fifty piastres. When this ceremony is concluded, the man to whom this function is delegated, places all the pieces collected into a wrapper and presents it to the bride. This custom is termed *Shobásh*;[5] and

[1] The *Ḳinṭar* according to Dozy (the French quintal from the root of the Lat. *centum*) is a weight of a hundred pounds and is still of that measure in Syria.

[2] As a unit of value, it is a piece of five piastres (from the Turkish *besh*, five, and the termination *lik* (لك) or *liḳ* (لق), signifying function or quality), but local variations no doubt account for the difference in the text.

[3] This is said *honoris causa*, to magnify the amount of the gift. The Turkish *líra* (gold) was current at 30½ to 33½ *krans* to the pound sterling in Turkish Arabia in 1891, the Indian rupee at 2½ *krans*, varying of course according to the relative value of the metals. The *ghursh* or piastre is a corruption of the German groschen.

[4] Plural of نقط *nakat*, pieces of money given to musicians at a fête or to the bride at a wedding, as in this instance. v. Lane, "Mod. Egypt.," XXVII.

[5] This term occurs in the "Arabian Nights" (715th night) pronounced *Shobash* (شوبش) in Egypt, and *Shubásh* in Arabic, derived from the Persian *Sháh-básh*,

is meant as an assistance to the bridegroom. After this, a quantity of fire-wood and cow-dung is collected, and the whole of it is placed in a large meadow, and about an hour after sunset all the men, that is, the whole tribe, assemble, armed with old pistols loaded with powder, and they set fire to the wood collected in the meadow at one time so that the flame shoots up to the height of five or six yards. All the men present then form a circle round the fire, and begin to shout the word *ḥawalaḥ, ḥawalaḥ, ḥawalaḥ*, which they repeat continuously for about four hours without adding to it a single syllable. This ring presents a most inspiriting sight for the fire is generally in full blaze and the men stand around it one beside the other, shoulder to shoulder, the right foot advanced and the left set back, like troops in order of battle, and they clap their hands together in such a manner that a spectator would be unable to determine whether it was a single stroke or the union of many, for they lower them together and raise them together: and notwithstanding the number of men in the circle, it would be impossible to discover one man in advance of another by a finger's breadth, as if they were proficients in geometrical science. When the circle is formed, some three or four women and girls of the bridegroom's relations, wearing their richest apparel and decked with ornaments and trinkets of silver and each with a sword in her hand, enter the middle of the ring and begin to dance, brandishing their swords and directing their points towards the men forming the circle as though attacking an enemy. Upon this the men get wild with excitement like savage animals and draw their pistols loaded with powder, pointing them at the feet of the women and girls as they dance. This performance continues for about four or five hours, the men and the women and the girls vehement and impassioned like camels or excited steeds; and all the while the perspiration pours down from the persons of the men and the dancing women as if from a spout of water. When their strength is exhausted with fatigue, some notable advanced in years, enters the circle formed by the men and calls out in a loud voice, "They are under your protection, O youths, they are under your protection;" upon which they cease their sport and excitement and take rest, and if one were to look at the hands of some of the youths next morning, they would be found swollen from excessive beating and at times their colour blue from the clapping together of the palms and it is often long before they are able to touch anything with their hands.

When all this severe exercise is concluded, they sit in companies

and is synonymous with *nuḳúṭ*. The allusion is to the buffoon's cry at an Egyptian feast, "Shobash 'alayk, ya Ṣáḥib al faraj," *i.e.*, 'a present is due from thee, O giver of the feast.' v. Lane, "Mod. Egypt.," XXVII.

on the ground and coffee which has been prepared for them is brought, after drinking which they depart, each one to his house. On the following day they re-assemble and return to the bridegroom, singing and firing off their pieces. The bridegroom prepares a repast in honour of the youths and after they have eaten and drank, they set to singing and dancing throughout the rest of the day. After this, the bridegroom is feasted in their houses for the space of seven days, breakfasting with one, dining with another and supping with a third until at the conclusion of the seven days the festival terminates.

Hospitality.

When a stranger approaches the tent of his host, its owner rises and hastens to meet him, holds the bridle of his horse and assists him to dismount and ties up the animal. Then with all expedition he brings out his best carpets and spreads them in an apartment of the tent not occupied by the women. A fire is quickly lighted and coffee is brought and he prepares a coffee-pot and offers it first to his guest and afterwards to any others present. After the coffee, some food is brought for the guest and when the guest or guests have eaten, the relatives of the host that may be present partake of the food that the guests have left. Should they invite the host to join them, he refuses, saying, "the host may not serve his own interests—be pleased to eat." When all present have eaten, the host comes and partakes of what food remains. Meanwhile an animal will have been killed and after a little, the host produces a dish of *burghul* and serves it on a platter of brass or wood of not less than a yard in width, and slices the meat in pieces upon the *burghul* and places upon the side of the platter the fat tail of the lamb together with the leg, before the guest. This large piece of meat goes by the name of *Shazât*. Before the meat is served, some water is brought that the guests may wash their hands, after which the meal is placed in the middle and some cold clarified butter is brought and placed on the top of the dish. The host then looks at his guest and says, "Partake, O stranger, of what has been provided," and he invites also those of his relatives who are present, who come forward and sit round the dish and begin to catch up portions in their palms; that is, they take a handful and shape it into a ball, fashioned somewhat oblong and placing the thumb below it, put it into their mouths and pressing it with the tongue, swallow it without the slightest chewing or mastication. Some of these balls occasionally equal a weight of sixty *dirhams*. When those present at the meal are so many that they cannot find room to sit at the dish together, they wait till a place is vacant, and as one vacates a seat, another takes his place and so on until all have eaten.

Meanwhile, that is during the repast, if the butter on the dish should run short, they add more, and one may sometimes see the butter streaming from the hands of the eaters as from a spout. When all present have had their fill, the host comes forward and eats from the side of the dish which often contains portions of food foul from the hands that have been stretched over it. If a guest stays till evening, fodder is given to his horse and another animal is killed, according to the manner above described.

It is customary for the guest when he is at table, to take some meat and give a piece to each of those present who are not seated at the meal in the first instance. When one of those seated at table rises, the host says to him,—"Fill O such a one, this vacant place." When the meal is done, the guest says to the host,—"Many thanks to the host; be this followed with lawful recompense." Meanwhile coffee is continuously being made and whenever one coffee-pot is emptied, another is produced until the guest departs. After his departure he continues still under the hospitality of his host who is responsible for any harm that may befall him, but should he become the guest of others on the road and partake of their hospitality and an accident subsequently occur or he be robbed, it is a charge on the later host and the responsibility of the first determines.

The rights of the host against the robber of his guest are based on prescribed rules. If it happen that the guest be plundered when on his journey from his host's roof, the latter rides with a number of horsemen of his kindred and tribe and visits the chief of the tribe to which the robber belongs and thus addresses him, "Such and such a one was our guest on such a day and he is a traveller on the road and our salt was in his stomach, (*i. e.*, he partook of our food) and he departed and before he had eaten of the salt of others, he was set upon by such a one of your tribe at a certain place. And when the man attacked him, he informed him that he was our guest and notwithstanding his protest that he was travelling under the protection of our salt, he robbed him nevertheless. Now we demand our due." Thereupon the chief of the plunderer's tribe sends after the offender and recovers the whole of the property robbed and makes it over to its owner. He then charges him with an indemnity for the host whose guest has been robbed, consisting of a male and female camel, ten head of sheep, a sword and a spear.

If the tribe of the robber refuse the demands of the guest's entertainers and will not give up the property plundered nor pay the indemnity to the host of the stranger, hostilities ensue between the tribes and occasionally many lives are lost.

Among the rights of the guest is that he shall leave his host's roof as he entered it and if, as sometimes happens, his horse is stolen from his host's house or should die, the host must provide another for him. In fine, the respect and reverence paid to a stranger among the Arabs are very great, which is a proof of their generous spirit, their magnanimity and sense of honour.

Mourning.

The customs observed on occasions of death. When a tribes-man dies all the men of his clan assemble and those who possess horses mount them and engage in a tournament as if they were on the field of battle.

In about half an hour's time, the horsemen dismount and tie up their horses and approaching the dead man, lay him out on a bed and place his weapons by his side. The women then advance attired in their best garments, with swords in their hands and begin to dance, brandishing their swords and singing for the space of about six hours, after which they follow to the interment. When the burial is over, the men and women return to the tent of the deceased and animals are killed and food prepared at the expense of the relatives of the deceased. The dishes are handed round to all present and after the repast, the men return to their houses and the women to the house of the deceased, where they remain during a period of from seven to forty days, the length of their stay depending on the position of the deceased. If he be among the chiefs of the tribe, the mourning and lamentations continue throughout forty days, but if he be of humble station, the period does not exceed seven days. During the whole of this time the relatives of the deceased must furnish the food and drink, coffee and tobacco, three times a day to all the women present.

On the expiry of this period, it is imperative on the relatives of the deceased to present each woman with some wearing apparel, that is, a garment such as a vest or petticoat of cloth, or head-dress or vesture [1] of silk, or a red boot.

Should the deceased happen to be one of the chiefs or of the richer class of the tribe, the expenses incurred by his people for food, drink, coffee and tobacco, sometimes exceed one hundred and fifty *líras*. Among their customs also is the following:—When news of a death reaches the neighbouring Arab families, each family repairs to the tent of the deceased to offer their condolences and take with them sheep and goats for slaughter which they term *ḳaydah*.[2]

[1] The word is عبا, which I do not find in any dictionary, and is not noticed by Dozy in his "Dict. des noms des Vêtements chez les Arabes."

[2] I transliterate with diffidence: the vowel-points are not given and the word

On arrival at the house of the deceased, all the animals that have been brought are killed, even to the very last, and are served up to the mourners upon dishes of *burghul* over which the butter flows liquid as water and the mode of eating is by pressing the food into balls, as is the custom on festive occasions. Another of their customs is that the women who are blood-relations of the deceased, such as his sister, his daughter, his wife or the wives of his brothers and uncles, tear their cheeks with their nails till the blood flows and rend their garments and throw dust upon their heads. Another custom is to let their hair loose over the face and shoulders. After the lapse of six months, the men and women of the tribe assemble at the house of the deceased and mourn for him during the day, at the close of which they visit the grave, and this ceremony is also performed on the anniversary of the death. The animals slaughtered after the interment of the deceased are called "a solace to the deceased."

Hostile Incursions.

By the word *ghazw* is signified the hostilities of Arab tribes against each other. When one tribe intends a foray against another, the Shaykh of the tribe warns the whole of his clansmen three days previous to the expedition. Upon this their leaders meet at the Shaykh's house, who, after performing the duties of hospitable entertainment and furnishing the horses with provender, thus addresses them,—"O chiefs of the Arabs, I have certain information that such and such a tribe of Arabs is encamped at a certain spot, and their gathering is extremely small and we mean to attack them after three days. Therefore warn your people to be in readiness, and at the appointed time let the horse assemble in such and such a district, and at such and such a spot."

Thereupon the leaders quit their chief, each one departing to his own party, and when they reach their tents, each of them assembles his men and entertains them and after the entertainment he addresses them as follows:—"We intend to attack such and such a tribe, at such and such a spot, on a certain day, and all the horsemen must be there assembled." The men then severally depart to their tents and every horseman must provide the requisites for the march in food and water for himself and his horse and the needful amount of barley for his horse, and on the appointed day, the horse assemble in one body, every horseman having his things laden on a camel and each camel led by a picked

is unknown to me in this sense, though *Ḳaud* (قَوْد) and *Ḳádat* have the meaning of a present or contribution of horses or camels, either as gifts or in token of vassalage.

man of its owner's relations; these camels are called by them *rakb* (camel-troop). The leader of the whole expedition is the Shaykh of the tribe, whom all obey. When the whole force is assembled, the Shaykh thus addresses them: "Ride forth, O horsemen, and you, O camel-drivers, go to a certain spot and there await the horsemen till they come to you." Upon this the horsemen set forth, making for the enemy's cattle where they may be grazing on the plain, and the camels march to the appointed place and lie in concealment. Let us now turn to the horsemen.

When they arrive within six or seven hours from the habitations of the enemy, the horsemen lie in ambush in a certain defile. A detachment of about ten of them then set out and march on till they near the enemy's tents and lie in ambush during the whole day and night, and in the morning they watch the direction taken by the cattle and the herdsmen to pasture. And as cattle must necessarily be sent with the drover to the plain, as soon as the horsemen on the look-out observe the herd leaving the tents for the pasturage, the detachment make for the ambush of their own people to give them notice that the cattle are moving towards a certain quarter. Upon this the Shaykh rides with the whole of his force after the cattle, having, as they put foot in stirrup, uttered some such words as, 'May God provide for our families!' When they arrive within an hour's distance of the cattle, they scatter in pursuit and collect all the cattle together and drive them forward in front of their horses. It is not long before the news reaches the owners of the cattle, who mount their horses to save their property from the hands of the enemy. Sometimes the pursuit by these horsemen of those of the enemy continues a whole day or more, until the one body overtakes the other, when the scales of fray and contest are balanced between the two forces. Should the owners of the cattle prevail, they recover the plundered camels and sheep and return with song and chants of victory and triumph and their women come out to meet them an hour's distance from the encampment with dance and pæans of joy. We shall now describe a few incidents of their skirmishes and attacks and the customs they therein observe. When a horseman overtakes another and wounds him with his lance or sword and hurls him from his horse to the ground, the latter calls to his overthrower: 'I am under thy protection; spare me, as may God spare thee' The victor then dismounts from his horse and binds his fallen adversary, driving him in foot in front of him after despoiling him of his weapons, and remounting, leads the horse of his captive behind him till he reaches his own people. He then digs a pit in the ground before his tent, about a yard in depth,

and places his captive in it and fills it up partially with earth and sets a covering over the pit. The feet of the captive are, meanwhile, fettered with iron, and every day he is given a little food and he is also daily taken out of the pit for about an hour for the usual necessities of nature. As often as he goes beyond the tents, his arms are pinioned and he is guarded by an armed man. When his needs are satisfied beyond the encampment, he returns with his guard behind him, who sets him in the pit as before. Sometimes the prisoner dies under this treatment and at others they take pity on him and set him free. But if another war breaks out between the two tribes, and the man captured again falls into their hands, they strike off his head at once without mercy. Another custom is the following; when one horseman meets another on the field of battle and cuts him down, the other cries out, "Spare me, as may God spare you: this shall be to me as a day of the days of the Arabs."[1] Upon this the victor stays his stroke from his suppliant enemy and exclaims, 'God has given thee life; go in peace and this shall be to thee as a day of the days of the Arabs." But if in subsequent hostilities between the tribes, the vanquished horseman is victorious and the one who had previously given him quarter or any of his relations falls into his power, he spares them and does not in any way molest them. This conduct is called by them an interchange of courtesy, but the honour rests with the first.

The narrative must now revert to the "RAKB," that is to the men before-mentioned, who were leading the camels and were in hiding with the water, provisions and fodder for the horses, awaiting the arrival of the foragers. These, whether successful or otherwise, must necessarily pass the camel-troop expecting them, and as soon as the horsemen arrive, the former mount their beasts. If the horsemen are driving their booty before them and the owners of the cattle are in pursuit to recover the cattle and the fight is going on, (they join)[2] against the enemy. Sometimes the defeat of the enemy is due to the camel-riders. But if the horsemen reach the camel-troop in defeat and not victorious, the latter accompany the horsemen returning to their people. Another of their customs is as follows: should the horsemen be returning from the foray with their booty and meet a man or a woman, the traveller, whether man or woman, will look towards the leader of the horsemen and say, "Brand the foot," and he will reply, "Welcome, welcome."[3] Thereupon the man will say to the Arab Shaykh, the leader

[1] The word "day" in this sense signifies a day of battle, and the "days of the Arabs," the recital of their engagements.

[2] These words are omitted and the ellipse mars the sense.

[3] In the text هلا و رحب for اهلا و مرحبا.

of the horsemen, "A share of the plunder, a share of the plunder;" upon which the leader will order a portion of the booty to be given him, whether of camels or of sheep. Sometimes the man's portion may be from one to ten camels, according as the plunder was much or little, and so likewise of the sheep. Another custom is this: should the expedition be successful in the capture of booty and carry it away, and the herds[1] that are harried belong to one or two individuals and not to the tribe in general, the whole tribe assemble and ascertain the number of camels that have been taken and collect of their own a number equal to that plundered, and give it to them in place of their camels. The share of the leader of the foray is customarily five times the amount allotted to individual horsemen. The remainder is divided equally between the cavalry and the camel riders without distinction of persons.

These customs are common to all the tribes.

Some Usages of Law.

The Judges among the Arabs are plain, blunt men, unable to read and write, inheriting the office from father to son. They settle the claims of litigants with prompt decision, giving to each one his due; and in my opinion the regular judges versed in the science of jurisprudence, fail in effecting what is accomplished by these uncivilised tribunals.[2] And here I will cite some instances of their decisions, arrived at by the exercise of common sense and not by the aid of treatises on law. Two married brothers in poor circumstances once lived in the same house, and it happened that both their wives were delivered on the same day, one giving birth to a boy, the other to a girl. While the mother of the boy was asleep, her sister-in-law, the mother of the girl, arose, and going to her bed took the child from her side and placed her own girl in its place. Now it is a custom among the Arabs to swathe their infants for some days and not to remove their bands. In the evening of the same day, when their husbands returned from pasturing their herds, each of the wives said to her husband:—"Good tidings, husband, I have been given a boy." Now the boy's real mother was aware that her sister-in-law had been delivered of a girl, and straight-way unswathing the child by her side, she discovered

[1] عصي plur. of عصا, literally, a shepherd's staff, and derivatively a flock of sheep (generally 400), committed to his charge. *v.* Dozy. Art, عصو. Here it is used synonymously with رعيّة, a herd of grazing camels.

[2] The Ḳázi el Arab observes Burton, was almost always some sharp-witted grey-beard, with a minute knowledge of genealogy and precedents, a retentive memory and an eloquent tongue. Mecca, iii. 45.

that it was a girl and not a boy : upon this she told her husband that she had brought forth a male, and her sister-in-law a female child, whereas now she found the female with herself and the male by the side of her sister. A contention arose, therefore, among them till the matter was carried to the Shaykh of the tribe, who directed them to proceed to the Ḳáḍhi who should judge between them. They presented themselves before the Ḳáḍhi and stated their case. The Ḳáḍhi thereupon ordered that a determinate measure of milk should be taken from the breasts of both the women, and he then weighed the milk of the one against the other in accurate scales. The milk of the boy's mother weighing somewhat heavier than that of the mother of the girl, he decided that the heavier milk belonged to the mother of the male child. He added that if they would not accept this decision, he would be compelled to put it to the test of the louse. Now lice are very common with the Arabs, and his intention was to place some of the milk of the male-child in a dish and to put a louse in the middle of it, whence it would not be able to extricate itself from the milk of the male owing to the presence of greater viscidity than is found in the milk of the female. Whereas if the louse be set in the milk of the female child, it will crawl out without difficulty, from the absence of this viscous matter. After the decision was given, an investigation and a close enquiry proved that the male child was stolen from his mother and in accordance with the sentence, the boy was restored to his true mother and the girl to hers.

A Second Instance.

A man married two women. One proved barren, the other not so. The latter gave birth to a son, for which reason her husband preferred her to the other. A violent jealousy took possession of the rival wife and she concealed in her heart a determination to destroy the child and she watched a favourable opportunity to commit the evil deed. One day, when the boy's mother set forth from the house to collect camel's-dung in the desert, the wicked woman placed her hand upon the child's mouth and nose and suffocated it. When the child's mother returned she found her son dead and the body turned blue whereupon she set up a shriek and kept wailing, "Alas, why hast thou done this to me," and a clamour arose between them, each wife's people taking her side and the altercation became violent till a war was imminent between them. At this juncture the chief arrived and quieted the tumult and ordered them to go before the Ḳáḍhi to decide between them. They duly presented themselves and set forth their plaints. The Ḳádḥi called the mother of the boy aside and said to her,—" I know that thy wicked

rival has killed thy son through envy. Now I require thee to do a thing, to which if thou consentest, I will lay the charge of murder against thy rival and her relations." The woman replied,—"What is it thou requirest of me?" He answered, "Go to the farthest end of the encampment and take off thy garment and wrap it round thy head so that thy shame be seen before all the Arabs, and walk from the end of the camp to this tent without any covering on thy body, after which I will decide in thy favour." The woman answered,—"No, my lord, I will not do this; rather will I forego the vengeance for the blood of my child and preserve my honour among the Arabs, or I shall lose both my child and my honour. I will never do this; never, never." The Ḳáḍhi replied—"Retire and rest in the women's apartment." He next called the other wife aside and said to her,—"I require thee to do something, which if thou dost, I will absolve thee from this crime." She replied. "I am at thy orders; what dost thou wish me to do?" He rejoined, "Thou must take off thy garment and wrap it round thy head," &c., as he had spoken to the rival wife. She answered at once: "This is easy, I will do it with willingness on condition that thou acquittest me." He said to her,—"Go to the end of the encampment and gird up thy garments and run through the midst of the Arabs, from thence hither, that all may behold thy shame and I will acquit thee." Upon which she set forth; whereupon the Ḳáḍhi summoned a respectable man and said to him, "Go after this woman to the end of the tents and if thou seest her uncovering her person, make her put on her garments and forbid her and bring her hither." The man did as he was ordered and after this, the Ḳáḍhi decided that the blood of the child should be demanded of the wicked woman. Some of the tribal chiefs objecting to sentence being passed against the woman in a crime of this nature without evidence, he replied that a woman who would sacrifice her reputation and immodestly uncover her shame before all the tribe, would undoubtedly be capable of so base a deed. They answered that his sentence was just, and she was condemned to death by strangulation, such as she herself had perpetrated with her own hands.

A Third Instance.

A number of persons were suspected of the murder of a traveller on his journey, but it was not known which of them was guilty of the crime. The relatives of the murdered man prosecuted five of them, from the knowledge that feelings of enmity had existed between them and the deceased, but they were not able to say definitely that *this* particular individual had killed *that*. When they appeared before the judge and he interrogated them searchingly, he found that all of

them repudiated the charge and as there were no witnesses to prove the case against any particular person, he declared that he would bring the criminal to justice in six months. After the lapse of the six months, the Ḳáḍhi requested the chief of the tribe to assemble the people on a large plain and place them side by side with their hands folded upon their breasts in the form of a cross. The chief told them in a loud voice that the Ḳáḍhi desired to whisper something to them, to which they should listen. Upon this the Ḳáḍhi whispered in the ears of all of them saying, "I wish to say but two words only, and when I speak them everyone who keeps his arms crossed on his breast, shall receive from the Emir a present of a horse, a sword, and a spear. Do you accept this condition?" he added. They all assented, and the Ḳáḍhi with the Emir and the other chiefs in attendance, stood before the assembled crowd, while the Ḳáḍhi thus exclaimed in a loud voice: "O, Arabs! I know that he whose fillet of rope[1] shall fly off his head, is the murderer of Ibn u'l Badín," (the name of the murdered man). Before the Ḳáḍhi had closed his lips, a man raised his hand to his head and felt his band. Thereupon the Emir, the Ḳáḍhi, and the chiefs came forward and laid hold of him, and he, after much questioning, confessed that he had killed the unfortunate man with his own hand.

Their Oaths.

The Bedouins constantly make use of oaths in their conversation. They cannot string a sentence together without *bi'lláh* or *ta'lláh* frequently reiterated, or *Ṣalát-Muḥammad*. These words are used in adjuration whether they speak truly or falsely, which makes no difference to them. But the oath which they regard as reliable and which they employ in their tribunals, and in important cases, is the following:—"By the staff and the adored Lord, and the geomancy[2] of Solomon, the son of David." Before taking this oath, the man grasps a staff in his hand and describes therewith a circle upon the ground in front of the bystanders, after which he takes this oath before the company, who thereby become witnesses against him. When they appear before the Ḳáḍhi in any important case, and the point is to be decided by oath, the Ḳáḍhi addresses him saying, "Say, O Bedouin, by

[1] This is the band of rope (*íḳál*) which serves to fasten the *kúfíyyah* or kerchief of cotton or silk, which the Bedouin wears round his head. Burton transliterates this word incorrectly, as *Aakal*, in his El. Misr. I., 346. ed. 1855.

[2] خط or علم الخط, equivalent to علم الرمل or geomancy.—These are lines made in sand, and even on paper, by the diviners; an ancient practice, according to Lane, still carried on at the present day, and employed to discover secret thoughts and things unknown and the like.

the stars and the planets, and the heavens and the earth." On his pronouncing these words before the assembly, the indemnity is paid, and the case is decided without further contention or dispute. They also employ other words, such as—"By the tomb of Ísa and of Músa." Such are the expressions they make use of in their oaths and asseverations. They pronounce these words in all their dealings with each other, and if one should borrow of another, the lender is satisfied with the oath alone without the written bonds customary among civilised communities. Experience shows that they keep due faith with each other and it is rarely that any differences arise between them. Praise be to God who has made them contented with their simple institutions!

Supplement to the Observations on Marriage.

When the dancing and singing and the ceremonies previously mentioned are over, the bridegroom rises to his feet, and rushes quickly through the women, taking any that may come on his way to the apartment occupied by the bride. He then strikes the bride with a staff, bruising her head, in the belief that he thereby acquires power over her and that she will never dispute his authority as long as she lives. Another custom is as follows: when the song and dance are over as above described, they make the bridegroom stand at the door of the bridal apartment, while two vigorous youths come up behind and push him with all their force. Should he fall on his face, they make merry over him and do not suffer him to marry that night, but if he does not fall, they depart to their homes and only his near relatives remain with him and the ceremonies are concluded.

Supplement to the Observations on Mourning.

When the mourning ceremonies are concluded, as above-mentioned, they carry the corpse upon wooden boards, as is customary with people in the towns. As they proceed and pass by any tent on their road, they feign inability to advance as if the deceased were dragging them by force to the tent they are passing, and so they carry him to it. The master of the house brings out for the corpse a vesture, a jacket or cloak, such as he may happen to possess, and this takes place from tent to tent till they reach the cemetery. They then bury him and return home after washing their hands upon the grave. This is done by one of the men present taking a ewer, while the rest step forward one by one to the grave and wash their hands, invoking the mercy of God upon him. They believe that the soul continues to abide in the left ear, and that the deceased hears all that is said to him whether prayers or aught else.

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NOTES ON ANTHROPOLOGY.

By H. H. Risley, Esq., *Indian Civil Service, Companion of the Indian Empire; Officier d'Académie Française; Director of Ethnography, Bengal.*

CHAPTER I.

The Place of Man in Nature.

In the first attempt to classify the animal kingdom, Linnæus placed men and monkeys side by side in the order of mammals which he designated Primates. In our own time there has been much discussion of the question whether the differences between the two correspond to the distinction between an order and a sub-order. Owen thought he had proved that in man alone the lesser brain is completely surpassed in size by the larger; but his theory, which would have given to man an indisputably higher structural rank than the most advanced apes, is now generally admitted to have been based upon erroneous observations.

Even the standard distinction between man as an animal with two hands, and apes as creatures with four, has been swept away by recent

investigations. Professor Huxley* has shown that in all important relations of number, arrangement and form, the tarsal bones of the gorilla resemble those of man. The only difference is, that in the gorilla the metatarsal bones are relatively longer and more slender, while the great toe is comparatively shorter and weaker, and along with its metatarsal bones is joined to the base of the foot by a looser and more pliable joint. But although the gorilla's hind member must be admitted to be structurally a true foot, its functions differ from those of the human foot, and this fact alone raises the morphological status of man far above that of the highest apes. Status in this sense depends upon specialisation of function. The more purposes a given member has to discharge the lower is its morphological rank. Thus a man's foot can only be used for walking; while a gorilla's foot, although a true foot in virtue of its anatomical character, is also a prehensile organ and therefore less specialised and of a lower type. Apes walk either on the outside edge of their feet, or, like the ourang-outang and chimpansee, on the upper surfaces of their toes, which are folded down when the erect position is assumed.† Differences of habit again lead to modifications of structure. The upright position leads to the shortening of the arms, which are no longer used for locomotion, though they retain their power of prehension, and causes the pelvis to asume the dish-like form adapted to support the intestines. The relatively capacious skull is evenly balanced on the vertebral column, and if, as is the case with the Negro, the jaws project greatly, the correlative development of the cerebellum serves to maintain equilibrium.

Embryological differences must not be left out of consideration. Eighty years ago Johann Friedrich Meckel, of Halle, discovered that during the period of immaturity, which lasts from the fertilization of the ovum to the first manifestations of sexual aptitudes, every animal passes through all the various stages of development which characterise the lower forms of life during their whole existence. At birth the difference between the human infant and the monkey is comparatively small. It takes an expert to distinguish the skull of a child from that of a chimpansee. In point of size there is little to choose; but an ape's brain does not grow much. Although it resembles the human brain in structure, its development follows quite a different course. The brain of the ape has, as a rule, stopped growing by the time the animal has got its second set of teeth, which is just the time when the real development of a child's brain begins. *Per contra*, the facial bones of the ape grow more rapidly, so that the biggest monkeys have the brain of an

* Huxley, *The Place of Man in Nature*, p. 105.

† Darwin, *Descent of Man*, i, p. 120.

infant combined with the jaws of an ox. So also the inter-maxillary bone disappears earlier in the human embryo than is the case with monkeys. It follows from all this that continued development can never turn a monkey into a man, for the evolution of the two types goes on in different directions, and the degree of divergence would therefore tend constantly to increase. In some of the lowest monkeys, whose development has been arrested, as is the case with the marmoset of Eastern Brazil, the brain-case approaches the human type more closely than that of the anthropoid apes.* It is therefore a vulgar error to suppose that the evolution hypothesis traces the descent of man to one of the four higher varieties of apes. Neither Darwin nor any of his followers have ever said anything of the kind, but have always maintained that the ancestors of the human race must have diverged from some long extinct variety of the catarrhine group in the early part of the tertiary epoch. In order to verify this hypothesis intermediate forms must be discovered connecting the eocene apes with the men of the present day. The chain of structural modification will then be complete. This missing link, however, will probably be found, not in Europe, which man seems first to have entered after his present stage of organization had been reached, but in Asia or Equatorial Africa, regions more likely *primâ facie* to have been the cradle of the human race.

We have spoken thus far only of physical characters, which entitle man merely to rank in the animal kingdom as a sub-order of the Primates. These are what determine his place from the scientific point of view, which is all that we are now concerned with. In the later papers we hope to deal with some of the higher distinctions between men and animals.

In illustration of the different phases through which the question has passed the most notable classifications of men and monkeys are shown below.

Order of Primates.

Linnæus—1735.

1st *genus.*	Homo	*Species sapiens*	Ferus, (savage) Americanus Europæus Asiaticus Asser (negro) Monstruosus (abnormal)
		Species sylvestris or troglodytes: Orang, etc.	
2nd *genus.*	Simia.		
3rd *genus.*	Lemurs.		
4th *genus.*	Vespertilio.		

* Virchow, *Menschen und Affenschädel*, p. 25.

Cuvier—1828.

1st *order.* Bimana: Man.
2nd *order.* Quadrumana—
1st *family.* Monkeys. { 1st *tribe.* Monkeys of old world. / 2nd *tribe.* Monkeys of new world.
2nd *family.* Marmosets.
3rd *family.* Lemurs.

Huxley—1871.

1. Anthropidæ: Man.
2. Simiadæ { Catarrhine { Anthropomorphic. / Cynomorphic. / Platyrrhine / Arctopitheca.
3. Lemurs.

Broca—1870.

1st *family.* Man.
2nd *family.* Anthropoids (chimpansee, gorilla, orang, and gibbon).
3rd *family.* Pitheca (semnopitheca, or sacred monkeys of India).
4th *family.* Cebia.
5th *family.* Lemurs.

Broca—1877–1880.

1st: Anthropomorphi { A. Man. / B. Anthropoid.
2nd: Monkeys { C. Pitheca. / D. Cebia.

According to Huxley, the different races of mankind fall naturally into two primary divisions: the *Ulotrichi*, with crisp or woolly hair; and the *Leiotrichi*, with smooth hair.

Among the *Ulotrichi* the colour of the skin ranges from yellowish-brown to the deepest charcoal-black. The hair and eyes are almost invariably dark, and the entire group, with the exception of the Andamanese, is dolichocephalic. The Negroes and Bushmen of Africa, and the Negritos of the Malay region, and of the Papuan islands belong to this stock. Some writers have proposed to include the Dravidians of India among them, but it may be doubted whether the physical characteristics of this type have yet been determined with sufficient certainty to enable the question to be finally settled.

The *Leiotrichi* or smooth-haired division are further divided into four groups:—

1. *Australioid* with dark skin and eyes, wavy, black hair and long prognathous skulls with well developed brow ridges. The Australians

are the chief representatives of this type, and Huxley also includes in it the inhabitants of the Dekhan and the ancient Egyptians. As regards the people of the Dekhan a doubt may be suggested, whether the data available are ample enough to justify this conclusion. One may also fairly ask what is meant by the phrase inhabitants of the Dekhan. Presumably the Dravidians, but the category is so large and indefinite that it may well give rise to some misapprehension. One is tempted to surmise that the people of the Dekhan have been included in this type on the strength of an examination of a limited number of Museum specimens, about the least trustworthy kind of evidence that can be resorted to. No one who is acquainted with the conditions which govern the collection and preparation of skulls in India, can fail to regard with profound distrust any of the ordinary collections; for the simple reason that in nine cases out of ten there is, and from the nature of the case can be, no guarantee whatever that the skulls are what they are represented to be. Pending therefore the fuller examination and determination of the Dravidian type, which may perhaps be looked for, we may be permitted to suspend judgment on the question whether it should be included in the Australioid group.

2. Next in order comes the *Mongoloid* group, with usually yellowish-brown or reddish-brown skins and dark eyes, the hair being long, black, and straight. The characteristic Mongolian skull is brachycephalic; in fact the most pronounced cases of brachycephaley are found among this group, and all Asiatic Mongols are markedly brachycephalic. On the other hand, the American Mongols are usually dolichocephalic.

3. The *Xanthrochroic* group is marked by fair skins, blue eyes, and abundant fair hair. The skulls of the most typical members of the group are almost invariably dolichocephalic, indeed Penka (*Die Herkunft der Arier*) regards this as one of the chief characteristics of the Xanthrochroic Scandinavians; but in Southern Europe the brachycephalic representatives of the type out-number the dolichocephalic. Teutons, Scandinavians, Slavonians, and the fair Celts are the chief members of this group; but distant off-shoots are also found in North Africa and Western Asia.

4. The *Melanochroi*, or dark whites, have pale complexions, dark hair and eyes, and usually long, but sometimes broad skulls. In Europe they are represented by the Iberians and "black Celts" of Western Europe. Professor Huxley is inclined to think that they are not a distinct group, but result from the mixture of Australioids and Xanthrochroi.

On Some Superstitions regarding Drowning and Drowned Persons.—*By* Babu Sarat Chandra Mitra, *Pleader, Judge's Court, Chupra.*

Anthropologists have come to the conclusion that the principle of Animism has its origin in the belief that every locality has its presiding spirits. This stage of belief is a characteristic of savage races and still survives as a relic of primitive faith among peoples who have now become civilised. Primitive men believed every mountain, rock and valley, every well and stream and lake, to be the abode of some spirits. This belief again originates from the association of the idea of personal life with that of motion, just as the swaying of a tree appears to the mind of primitive man to be a proof of personal life like the flight of birds or the movements of animals. This idea became gradually developed and, in conjunction with dreams during sleep, reminiscences of the dead and accidental associations of motionless objects with motion (as of a rock in the midst of a rapid or eddy) gave rise to Animism or Spiritism. Primitive man was awe-struck at the majesty and grandeur of a mountain and, inwardly reflecting that this must be caused by spirits or beings superior to himself, believed the mountain to be the local habitation of these beings.

Relics of savage Animism are still to be met with among civilized races: such as the mountain-worship of the Japanese, the well-worship prevailing in the different counties of Great Britain and Ireland, and the river-worship of the Hindus. The Ainos, who are the aboriginal inhabitants of Japan, profess "the rudest and most primitive form of nature-worship, *attaching a vague sacredness to trees, rivers, rocks, and mountains*, and vague notions of power for good or evil to the sea, the forest, the fire, and the sun and moon."* This belief still survives among the modern Japanese who worship mountains. Miss Bird says (page 108 of Vol. I of her work): "Mountains, for a great part of the year clothed or patched with snow, piled in great ranges round Nantaisan, their monarch, are worshipped as a god." At page 122 of the same volume, she again says: "The mountain-peak of Nantaisan is worshipped, and on its rugged summit there is a small Shinto shrine with a rock beside it on which about one hundred rusty sword-blades lie—offerings made by remorseful men whose deeds of violence haunted them till they went there on pilgrimage and deposited the instruments of their crimes before the shrine of the mountain-god."

In the same manner, primitive man believes that every river has

* Miss Bird's *Unbeaten Tracks in Japan*, Vol. II, page 94.

its presiding spirit, and instances of this belief are still to be met with among peoples of savage culture. The Tshi-speaking peoples of Africa believe in a great spirit Prah who presides over rivers and to whom they offer human sacrifices—one adult male, and one adult female—in the belief that the spirit can do harm to the people through the agency of the rivers. By the principle of substitution, offerings of flowers, fruits, sweets, cereals, and incense which the Hindus of Bengal offer every year to the Ganges, Brahmaputra, Padmâ, Nerbudda and other rivers, have taken the place of the human sacrifices which are offered by savage peoples to the great River-Spirit.

Traces of the belief that every river, sea, and other bodies of water have presiding spirits, and that they require human sacrifices, are to be found even at the present day in the shape of various superstitions about drowning and drowned persons which are prevalent among civilized peoples. Hence the reluctance displayed by some peoples to save a man from drowning if he falls into the river or the sea. In the Solomon Islands, when a man falls into the river and is attacked by a shark, he is neither helped out of the water nor is he assisted in warding off the attack of his marine assailant. If the person any how manages to escape from the jaws of the shark, his fellow-tribesmen throw him back into the water so that the shark may make a meal of him. This they do under the impression that the victim is destined to become a sacrifice to the river-god.* Another form of this antipathy to saving a drowning man obtains in Scotland and has been recorded by Sir Walter Scott in "*The Pirate.*" In that story the peddler Bryce refused to assist Mordaunt in saving the life of the shipwrecked sailor from drowning and even rated him roundly for attempting to do such a thing. I will reproduce the conversation which took place between the two, because it shows the motive for not assisting a man from getting drowned. Bryce said, "Are you mad, you that have lived sae lang in Zetland, to risk the saving of a drowning man? Wot ye not if ye bring him to life again, he will be sure to do you capital injury?" The origin of this belief is stated by some to be the idea that the person rescued from being drowned will, some day or other, do a mischief to the man who saves his life. Others say that it has its foundation in the belief that, as rivers and seas are entitled to human sacrifices, the presiding spirits of those bodies of water will wreak their vengeance on those who prevent them from getting the victims, as is illustrated by the item of folklore from the Solomon Islands or by that prevailing in the Orkneys and Shetlands. It is said

* Codrington's *The Melanesians*, page 179.

that "among the seamen of Orkney and Shetland it was deemed unlucky to rescue persons from drowning since it was held as a matter of religious faith that the sea is entitled to certain victims, and if deprived would avenge itself on those who interfere."*

The superstition that the water-spirit, if despoiled of his victim, will wreak vengeance on the person who deprives him of the sacrifice due to him, is prevalent, in one form or another, among many races in various parts of the world. It exists among the sea-faring population of Great Britain and Ireland and especially among those of Cornwall. The sea-faring community of France, the boatmen who ply their vocation on the River Danube and the common peasant folk of Russia also share in this belief. Formerly a superstitious belief was current amongst the Bengalis that a water-spirit in the form of an old hag—called जटेबुड़ी—haunts tanks and ponds, and when any person goes thereto, she fetters that person's feet with an invisible chain. The victim is allowed to go wherever he likes, dragging the invisible chain, long as the daylight lasts, but as the shades of evening begin to fall, the जटेबुड़ी begins to withdraw the chain, and, therewith, the victim is gradually drawn into the waters of the tank and drowned. This superstition, is now fast vanishing before the progress of English education and enlightenment and now only lingers as a relic in the threat with which Bengali infants are frightened, namely, that, should they become naughty, the जटेबुड़ी will catch them and take them away. Another mythical being, named जख, was believed to exist in Bengal formerly. It was supposed to guard hidden treasure and to reside in tanks. It was also said of this being that if anybody went to take the treasure in charge of the जख, he was dragged into the water by that spirit and killed by being submerged in it. This bit of folklore is also disappearing. The Siamese believe in a water-spirit called Pnük, who, they say, seizes those who go to bathe in the water and drags them down. The Sioux Indians entertain a similar belief in a water-demon whom they call Unk-tahe and who, they believe, kills men by dragging them underneath the water in a way similar to the Siamese Spirit. The Kamschatkadales refuse to help a drowning man out of the water, on account of some similar superstitious scruples. If such a man was anyhow rescued, no one of his fellow-tribesmen would allow him to enter his house or give him food, but, on the other hand, would take him for one who is dead. The Chinese also display a similar sort of reluctance to save a drowning man because they believe that the spirit of the drowned man hovers over the water till it succeeds in

* Tudor's *Orkney and Shetland*, page 176.

killing a fellow-creature by dragging him underneath the water and drowning him. It is also popularly believed by the Hindus of Bengal that the spirits of persons who have come by their deaths from drowning, haunt the tanks and wells in which they have been drowned. Persons are afraid of going to such tanks and wells after nightfall, from a superstitious dread that the ghost of the drowned man would be sure to appear to him, or some other evil would happen to him. The waters of such tanks and wells are considered impure and unclean until those receptacles of water are reconsecrated and thus rendered pure, by performing some होम or sacrifice, or some *Jagna*. Like the Bengalis, the Japanese also consider the water of wells wherein persons have been drowned as impure. Miss Bird, at page 184 of Vol. I of her above-quoted work, says: "I have passed two wells which are at present disused in consequence of recent suicides by getting drowned in them." There is a belief current among the people of Bangalore in Mysore, that the spirits of those persons who have been drowned possess women.*

There are some omens which are superstitiously believed to prognosticate death from drowning. Before the days of the Suez Canal, when ships used to come to India by the route round the Cape of Good Hope. European sailors believed that a "Phantom Ship," which they called the "Flying Dutchman," used to sail near the Cape and would appear to passing vessels in times of storms. Sailors believed that the vessel which sighted the "Phantom Ship" would surely come to grief, and all the crew on board the vessel would be drowned. Captain Marryat has founded the plot of a novel upon the legend of the "Flying Dutchman." There is a superstition in Bengal among the lower classes of Bengalis, that if a single female goes in a boat in which there are male passengers only, the boat would come to grief and the passengers drowned. In order to obviate this evil, the single female passenger must tie a knot in her cloth and must call to mind the name of another female. I once saw a curious illustration of this superstition. In May or June 1884, I had occasion to go over to Seebpore on the other side of the River Hooghly. I hired a boat from the Colvin's Ghat, Calcutta, and was crossing the river. While in midstream, the wind began to blow a regular gale, and the boat was tossed to and fro. My fellow-passengers assured me that the rough weather was the consequence of the presence of a single female who was a passenger in the same boat with us. On a previous occasion also, while going to Seebpore, I was accompanied by a single female—a relative of mine, and, when stepping into the

* "Note on a Mode of Obsession, which dealt with the Belief in a part of Bangalore in the Possession of Women by the Spirits of Drowned Persons" by F. Fawcett, in the *Journal of the Anthropol: Soc: of Bombay*, Vol. I. No. 8.

boat, I saw her tie a pice in a corner of her cloth, mentioning the name of another female, as there was no other female passenger in that boat. This she did to obviate the consequences of the popular belief that a boat with a single female passenger would come to grief. There are also the Bengali superstitions that women who have got children must not put water into a vessel containing lime, after taking their meal, otherwise their children will get drowned.* Also a person who dreams that he is drowned in mire, ought to know that such dream prognosticates an early death to him.* The Bengali Hindus also believe that those persons who have got convolutions of hair (peculiar growth of the hair in a spiral form, which is called in Bengali चुलेरपाक), are sure to get drowned. I came across a curious instance of this superstition lately. In the beginning of August last, a nephew of a Bengali pleader of the Chupra Bar got drowned while bathing in the River Saraju which flows past that town. While on a visit of condolence to the bereaved gentleman, another Bengali gentleman—also a pleader of the local bar—asked one of the uncles of the drowned boy whether the deceased had got a convolution of hair on his head. On being informed that he had got one, the gentleman told us all, that since the deceased had such a convolution of the hair, he was sure to have died by drowning. The aforesaid gentleman also informed us that his second son had also got a similar convolution of hair, and that he was afraid lest he should also get drowned. He further told us that, in consequence of his son's possessing such a convolution, he did not allow him to go to bathe either in a tank or in the river.

There are also certain processes which, if had recourse to, would prevent a person from getting drowned. The performance of certain religious ceremonies is also supposed to have the same effect. Sailors believe that if a portion of the caul which covers the face of some children at the time of birth, be worn as an amulet round the neck, the person wearing it will not get drowned. In Bengal, it is sometimes believed that if a person accidentally eats ants along with sweets or other eatables, he will not get drowned. When a person is about to go to a distant part of the country and will have to cross rivers, the Hindus of Bengal, previous to the starting offer pujas to the goddesses of the rivers Ganges, Brahmaputra, Padma, Nerbudda, &c., &c., so that no mishap may occur. In our own family at Calcutta, I have observed similar pujas offered to the family idol Nârâyaṇa (who in this case is supposed to represent those river-goddesses), before any member of the family undertakes a journey

* *Vide* items Nos. 150, 155 and 189 in paper "On Popular Superstitions in Bengal," published in the *Journal of the Anthrop : Soc : of Bombay*, Vol. I., p. 354.

to a distant part wherein he will have to cross rivers, simply for the purpose of appeasing the river-goddesses who will, therefore, preserve him from all accidents in the rivers. The Bengali boatmen cry "*Badar, Badar*" when a boat is in danger of capsizing, in the belief that doing so would cause the vessel to reach its destination safely. The Ainos, who are the aborigines of Japan, believe that if they throw the images of their gods, which are nothing but wands and posts of peeled wood, whittled nearly to the top, from which the pendent shavings fall down in white curls, into rivers, streams, rapids and other dangerous places, they will be able to cross them safely.* The Japanese worship a god who, they believe, saves men from drowning and accident. They have also an amulet which saves persons from drowning. Miss Bird says, "The amulet which saves from drowning is a certain cure for choking, if courageously swallowed."† The Kakhyens of Burma worship a Nat called the *Khakoo Kha-nam*, the god of water—on the occasion of any-one getting drowned. They also worship another Nat named the Ndong Nat (Aing-peen Nat of the Burmese)—the God of the Outside of Home, who, they believe, resides in the house, but *is worshipped by them outside if one of the family is killed by drowning.*‡ The Mahommedans, when undertaking journeys by water utter, as a protective from drowning, the following formula which is contained in *Surah Nooh* of the Koran:—

بسم الله مجريها و مرسها إن ربى لغفور الرحيم

The whole may be transliterated in Roman characters thus: "Bismillâheh majrihâ o mursâhâ innâ rabi-il-ghafur ur-rahim." The origin of this custom is contained in the following legend which runs thus narrated in Urdu:—

قصه طوفان حضرت نوح عليه السلام كا مشهور هى برمختصر يه هے كے طوفان شروع هوا حضرت نوح عليه السلام هر ايك جانورون كا ايك ايك جوزا اور يهان سے رفيقون كے ساتهه كشتي مين سوار هوے باقي لوگ حتى كه ايك لڑكا حضرت نوح كا بهي به سبب نافرماني كے غرق هوا تمام روے زمين دريا هوا درختون اور پهاڑون سے جب چاليس گز پاني بالا هوا اهل كشتي شدت باد اور كثرت افواج سے بد حواس اور زندگي سے مايوس هوے حكم الهي هوا بسم الله مجريها و مرسها إن ربي لغفور الرحيم جو كوئي ورد زبان كريگا حق تعالى اوسكى سب مشكلات آسان كريگا الله تعالي نے اپني اسمكے بركت سے اونكى دريني سے اور طوفان موقوف هوا *

The legend in Urdu may be thus translated into English:—

"The story of the Deluge of the Patriarch Noah—on whom be peace—is well-known. The long and short of it is that when the Deluge

* Mrs. Bird's *Unbeaten Tracks in Japan*, Vol. II, p. 95.

† *Op. cit.* Vol. I., p. 379 and p. 380. ‡ Anderson's *Mandalay to Momien*, page 457.

commenced, the Patriarch Noah took a pair of each kind of animal and then repaired with his nearest relatives to the Ark. The rest of the people, as also a son of the Patriarch Noah were drowned on account of disobedience. The whole of the earth was flooded, and when the waters rose to the height of 40 yards above the trees and mountains, the inmates of the Ark, on account of the terrific storm and the fury of the waves, became senseless with fear and despaired of life. Then God ordered:—'Whoever will utter the words, Bismillâheh majrihâ o mursâhâ innâ rabi-il-ghafur ur-rahim,'* the Almighty God will deliver him from all difficulties. The Almighty God will, by the benign influence of His Name, preserve him from drowning. And the storm was allayed."

The Russians also believe that saving the life of a drowning man excites the wrath of the water-spirit. An illustration of this item of Russian folklore is given by Mr. Barry, in his novel entitled "Ivan at Home," which is descriptive of Russian life:—"Once upon a time, a drunkard fell into the water and disappeared. Some spectators who stood close by on the shore, did not shew any inclination whatever to save the drowning man. The man was drowned. The villagers held a court of enquiry, to investigate into the matter of that man's death from drowning. In the course of the enquiry it was elicited that no cross had been found on the neck of the deceased. The village Daniels, who sat to enquire into the matter, quickly returned the verdict that the man had got drowned because he had no cross upon his neck." The fisherfolks of Bohemia also display a similar kind of reluctance to save a man from drowning, under the impression that the presiding spirit of the water would get angry at thus being deprived of his victim, would give him bad luck in fishing and soon get him drowned. The same superstition also obtains in Germany, and, when a person comes by his death from drowning, the German peasants say, "The river-spirit claims his annual sacrifice," and sometimes also, "The nix has taken the drowned man." Mr. Jones, in his "*Credulities Past and Present*," offers an explanation to the effect that "a person who attempts to rescue another from drowning, is considered to incur the hatred of the uneasy spirit, which is desirous, even at the expense of a man's life to escape from its wandering." Dr. Tylor, in his "*Primitive Culture*," explains the super-

* This formula may be translated into Urdu as follows:
ساتھہ نام اللہ کے ہی چلنا اوسکا اور ٹھہرنا اوسکا تحقیق کے رب میرا البتہ بخشنے والا اور مہربان ہی *

The above may be translated into English thus. "The moving and the stopping (of this boat, *i. e.*, Noah's Ark) depends upon the influence of the Name of God. or in truth, our God is preëminently, a Pardoner of sins, and Merciful."

stition by saying that such reluctance is only a relic of the ancient belief that the water-spirit very naturally used to get angry on being deprived of his intended victim and, consequently, bore ill-will towards the persons who ventured so to deprive him, and would try to wreak vengeance on him at the first opportunity.

There is another class of popular beliefs as regards the time when the body of a drowned man would float up. In past times, it was popularly believed that the body of a drowned man would float up on the ninth day. This belief is prevalent in the county of Durham, as we are informed, on the authority of Mr. Henderson. Sir Thomas Browne, the author of the "*Hydriotaphia*" and the "*Religio Medici*," has also discussed this popular belief in his *Pseudodoxia Epidemica*.

In ancient times, people believed that the spirits of those persons who had been drowned in the sea, wandered for one hundred years, owing to their corpses not having been properly buried with all the rites of sepulture. Relics of this belief are to be found even at the present day. The belief still lingers among ignorant fisherfolk in some parts of England, that the spirits of those sailors who have been drowned by shipwreck frequent those parts of the shores near which the shipwreck took place, and some of them even assert that they have heard the spirits of the drowned sailors "hailing their own names." Hunt, in his "*Romances of the West of England*," refers to this belief, and says, that fisherfolks are afraid of walking in such localities after nightfall. This belief is similar to the Bengali superstition, described above, that the spirits of drowned persons haunt those tanks and wells in which they have been drowned, and has its counterpart among other races of people all over the world.

Lastly, there are some curious popular beliefs about the methods by which the corpses of drowned persons may be discovered. One of these methods is to tie up a loaf of ryebread in the shirt of the drowned person and set it afloat in the water, near the place where the person was drowned. It is believed that the loaf of bread will float until it reaches the spot where the body of the drowned person lies, and then sink The *Indian Mirror* of Thursday, the 29th September 1892, gives the following account of a search, in the aforesaid way, after the body of a drowned boy:—

"A novel method was adopted at Springfield, Illinois (United States of North America), in searching for the body of a drowned boy. The searchers tied up a loaf of ryebread in the lost boy's shirt and set it adrift in the water above the place where the lad was drowned, the theory being that the loaf would float until it came close to the body. The package in this case is said to have floated until it reached a certain

point, when it suddenly sank. The boy was found within a few feet of the spot."

This belief is to be found in other forms in many countries. Another form of it consists in floating a loaf weighted with mercury, which is believed to float at once towards, and stand over, the spot where the corpse lies. A writer in an American paper gives the following instances of this belief: "Some years ago, a boy fell into the stream at Sherborne, Dorsetshire, and was drowned. The body not having been recovered for some days, the mode of procedure adopted was thus: A four-pound loaf of best flour was procured, and a small piece cut out of the side of it, forming a cavity, into which a little quicksilver was poured. The piece was then replaced, and tied firmly in its original position. The loaf thus prepared was thrown into the river at the spot where the body fell, and was expected to float down the stream till it came to the place where the body had lodged. But no satisfactory result occurred." In another form, this belief is also prevalent among the aboriginal Indians of North America. Sir James Alexander, in his work on Canada, says: "The Indians imagine that in the case of a drowned body, its place may be discovered by floating a chip of cedar wood, which will stop and turn round over the exact spot. An instance occurred within my own knowledge, in the case of Mr. Lowery, of Kingston Mill, whose boat was overturned, and himself drowned near Cedar Island, nor could the body be discovered until this experiment was resorted to." The writer in the American paper, from whom I have quoted the above, says: "Not many months ago a man was drowned at St. Louis. After search had beed made for the body, but without success, the man's shirt, which he had laid aside when he went in to bathe, was spread out on the water, and allowed to float away. For a while it floated, and then sank, near which spot, it is reported, the man's body was found." Another modification of the theory of the discovery of a drowned man's corpse by a loaf, is current in Brittany. When a man gets drowned in Brittany and his corpse cannot be recovered, a lighted taper is stuck into a loaf of bread, which is then set adrift in the stream. Wherever the loaf of bread stands over, still, there, it is believed, the corpse lies underneath the water. Another modification of this belief consists in tying round a wisp of straw, a strip of parchment having on it some cabalistic letters written by the parish priest, and setting it afloat in the stream. Wherever it will stop still, there, it is believed, the body is sure to be found. A correspondent of *Notes and Queries* says that the corpse of a drowned person was recovered by this means.

In some other countries, a living animal is employed for the purpose of recovering the body of a drowned man. It is believed that the

animal will either cry out or sink at the exact spot where the corpse lies. In Norway, the people searching for the body take a cock with them in the boat and row with it hither and thither. It is believed by them that the cock will crow when the boat reaches the spot where the body of the drowned man lies. In a similar manner, the Javanese throw a living sheep into the water, when the corpse of a drowned man has sunk. They believe that the spot where the sheep sinks is the place where the dead body is sure to be found.

On Some Beliefs in a Being or Animal which is supposed to Guard Hidden Treasure.—*By* Sarat Chandra Mitra, M.A., B.L., *Pleader, Judge's Court, Chupra.*

Among some races of men there still lingers the belief that treasure, either kept concealed by men, or lying embowelled in the recesses of mines underneath the earth, are guarded by some mythical beings or animals. This belief seems to have been prevalent among the ancient Persians, for allusions to it are to be found in some of the classical works of their literature. Sometimes artificial means were resorted to by other races of people, as for instance the Bengalis, of killing a human male child and appointing his manes to be the guardian of the treasure which was made over to his charge and was hidden under the earth. This is a relic of the belief still prevalent among primitive men like the savage races of Africa, that the manes of the wives, slaves and horses killed at the funeral of a deceased chieftain, would accompany him in the next world, and that the hunting implements and other articles used by the deceased in his life-time, if buried with his corpse, would be of service to him in the life beyond the grave. In olden times in Bengal,

> "When the good old rule, the simple plan,
> That he should take who has the power
> And he should keep who can,"

was the order of the day, the people of Bengal resorted to the expedient of concealing their surplus treasure underneath the ground and appointing a Yakh (যখ), to keep watch and ward over it. The word Yakh (যখ) is a corruption of the Sanskrit word যক্ষ (Yaksha)—a name applied to a class of beings who were supposed to people the upper regions, and allusions to whom are frequently to be met with in Sanskrit literature.

The ceremony of appointing a Yakh (যখ), may be described thus: A male child was kidnapped without his parents knowing of it. The child was then bathed and clad in a new *dhoti*. Garlands of flowers were put round his neck. He was then worshipped. Then an excava-

tion was made in the ground, sufficiently large to accommodate the would-be Yakh and to contain the treasure, which was put into a number of *ghaḍas* (घड़ा), or pitchers of bell-metal. The child was then made to sit in this excavation, and the *ghaḍas* containing the treasure were arranged in it. A lamp containing a wick in some *ghi* or clarified butter, was lighted and kept burning near him. Then an invocation was made to the Yakh, that the treasure was being made over to him and that he should keep strict watch and ward over it. Then the excavation was closed by placing some planks over it, and earth was then thrown over it. The child gradually became drowsy, owing to asphyxia, and remained alive so long as the lamp kept burning. Ultimately the child used to die of suffocation. The spirit of the dead child, thus, became the guardian of the hidden treasure.

This practice was frequently resorted to in the olden times, and even after the establishment of British Rule in Bengal. It is now no longer heard of. If the parents of the missing child any how got scent that their child had been kidnapped and was being made a **यख**, and if they got any clue to his whereabouts, they immediately went thither, rescued the child from a horrible death, and appropriated the treasure to themselves, for the real owner thereof did not dare appear and prefer a claim to it, for fear of being punished for kidnapping and attempted manslaughter. Hence all the ceremonies were performed secretly so that the parents of the kidnapped child might not know of it.

Many tanks in Bengal had the evil repute of being haunted by Yakhs. I recollect having heard, in my childhood, from my mother and grandmother, many a mythical story to the effect that the Yakhs used to come up to the steps leading into the tanks, and place thereon the *ghaḍas* containing the hidden treasure, and disappeared within the depths of the tank as soon as a human being appeared on the spot, the *ghaḍas* also vanishing into the water. Whoever attempted to appropriate the money was killed by the Yakh.

This practice has now fallen into desuetude owing to the security of property and wealth, enjoyed under the aegis of British Rule, to the fear of prosecution for kidnapping and attempted manslaughter, and, above all, to the spread of education and the consequent enlightenment of men's minds from superstitious beliefs. Traces of the belief in **यख** still survive in several Bengali proverbial expressions. A thing which is highly prized by its owner and which he is loth to part with, is spoken of as being a **यखेर धन** or *the treasures of a Yakh.* A person carefully watching a thing or anxiously waiting for some other object, is spoken of as **यक्खिर मतन बसे आछे** or as sitting like a Yakh.

Similar beliefs about a mythical animal keeping watch and ward

over hidden treasure are also to be met with among other races of men. The ancient Persians had a belief prevalent amongst them to the effect that hidden treasure was guarded by a Mâr (مار) or snake. An allusion to this belief is to be found in the *Gulistan* of Sheikh Sadi, which was published in 656 A. H. (A. D. 1258). The story stands 13th in number, in Chapter V. of that work, and is as follows :—

یکي را زني صاحب جمال درگذشت * و مادرزن مرتوب بعلت کابین در خانه
متمکن بماند * مرد از مجاورت او چاره ندیدي تا گروهی آشنایان بپرسیدن امدندش *
یکی گفت چگونه در مفارقت آن یار عزیز * گفت ناویدن زن چنان دشوار نیست که
دیدن مادر زن * گل تبا راج رفت و خار بماند * گنج بد داشتند و مار بماند *

The above may be translated thus : A person had a beautiful wife, who died. The mother-in-law, an old woman, remained a fixture in the house, on account of the dowry. His neighbours, perceiving no remedy, came in a body to him on a visit of condolence. One of them asked how he was faring in that state of separation from his beloved wife. He replied that the separation from his wife was not so intolerable as the presence of his mother-in-law. "The rose has been plucked and the thorn left. *The treasure has been carried away and the snake left.*"

There was also another belief prevalent among the ancient Persians to the effect that hidden treasure is guarded by a mythical creature named طلسم (*Tilism*), which neither enjoys the treasure nor permits anyone else to enjoy it. There seems to be a difference of opinion about the meaning of the word طلسم (*Tilism*, from which is derived the English word *Talisman*). Davy, in his well-known Persian-English Dictionary, gives the following enplanation of this word :

طلسم Tylsem. A Talisman, or magical image, upon which, under a certain horoscope, are engraved mystical characters, as charms against enchantment, or fascination. *They use Talismans as preservatives in various ways, particularly in burying them with treasure, to prevent it from being discovered.*

There are allusions to this latter belief in Sheikh Sadi's Bustan, Chapter II., on Beneficence (باب دوم در احسان) in the story of the Miser and his Prodigal Son (حکایت پدر بخیل و فرزند لااو بالی). The couplets are as follows :

بخیل توانگر بدینـــار و سیم * طلسمیست بالای گنجی مقیم
ازان سالها می بماند زرش * که لرزد طلسمی‌چنین برسرش

They may be translated thus :

The miser, rich in dinars and silver,
Is a tilism dwelling over the treasure.
His gold remained years, for the reason
That such a tilism trembles over its head.

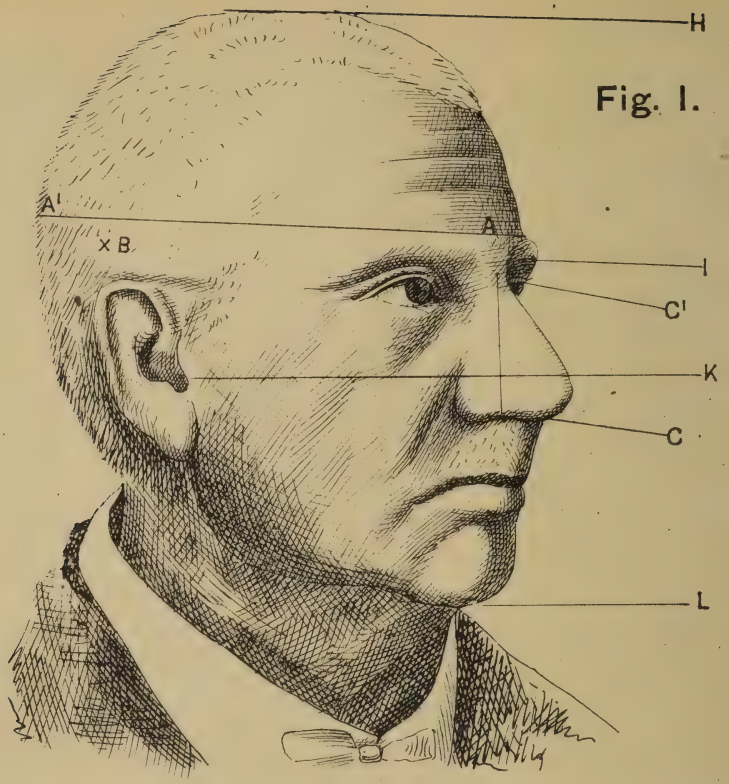

Fig. 1.

Cephalic.

A ... A^1	Maximum antero-posterior diameter from glabella or eminence above root of nose (A).
B.	Approximate starting point for maximum transverse diameter B—B

$$\text{Cephalic Index} = \frac{B \ldots B \times 100}{A \ldots A^1}$$

Nasal.

C ... C^1	Height of nose from nasal spine to root of nose, from one to three millimetres below transverse axis of eyes.
D ... D (See figure 4.)	Maximum width of nose outside nostrils, without depressing flesh.

$$\text{Nasal Index} = \frac{D \ldots D \times 100}{C \ldots C^1}$$

Vertical proportions of the head.

H ... I.	Height of head from vertex to intersuperciliary point, *i.e.*, to centre of a line drawn at a tangent to the curvature of the eye-brows.
H. ... K.	Height of head from vertex to tragus.
H. ... L.	Height of head from vertex to bottom of chin.

ANTHROPOMETRIC INSTRUCTIONS.

By the Hon'ble H. H. RISLEY, C.I.E.,
Honorary Member of the French Academy,
President, Anthropological Society of Bombay,
Secretary, Anthropological Branch, Asiatic Society of Bengal.

In selecting subjects, only adults between the ages of 25 and 45 should be taken. Accurate determination of age being of course impossible, those persons must be rejected who are obviously not fully grown, or who appear to be over 45, deformed persons, dwarfs, cripples, and men who have suffered from any disease affecting the form of the nose. In measuring the higher castes it is as well also to reject persons of very black complexion and with very broad and depressed noses, as in such cases there is at least a suspicion of the intermixture of low-caste blood. Similarly among the lower castes, men of very fair complexion and high-caste type of feature should be rejected. The object is to determine the standard type of each caste, and for this purpose individuals of clearly exceptional colouring and feature should be excluded.

The subjects to be measured should be made to sit down in line, and great care should be taken that this order is not disturbed, and that if a man gets up and goes out he returns to his proper place in the line. If this rule is not observed, the subjects will get mixed, and the dimensions recorded under one serial number will belong to different individuals. The risk of this is not so great if all the measurements required are taken consecutively on each subject. But, after trying both plans myself, I think the simplest and most expeditious plan is to take all the measurements for which the same instrument is required on each subject in order. For instance, all the subjects should be measured in order with the cephalometer, each man after measurement returning to his own place, then with the nasometer, then with the graduated square and steel pointer, and last of all with the goniometer. If the services of an assistant are available, he may be told off to watch the subjects, to see that they do not change places, and to bring them up in order for measurement.

The points from and to which each measurement is taken are shown in the appendix, and the instructions given there are illustrated by plates. I will now add a few remarks on each measurement, derived from my own experience.

Cephalic dimensions.—These are taken with the cephalometer (compas d'épaisseur de Broca). The subject should be seated on a chair or stool. For the antero-posterior diameter (A—A_1 in Fig. 1) the starting point is the glabella. This should be felt for with the forefinger, and the instrument so held that its point will pass along the forefinger and remain firmly on the glabella. Care must be

taken that the point does not slip off the glabella. The point of maximum length at the back of the head will usually be found nearly in the same plane with the glabella. In searching for it, the posterior point of the cephalometer must be kept moving up and down in the central perpendicular line of the back of the head, and the graduated scale of the instrument must be watched so as to see when the maximum diameter has been reached. The *inion* or occipital protuberance is *not* the point to be measured to. A magnifier may be used to read the scale of the cephalometer, which is graduated rather minutely. After having found the maximum, the measurer should take care not to remove the instrument from the subject's head *before* reading off the measurement, or if he does so, should tighten the screw. Experience shows that it is very difficult to remove the instrument without altering the reading, unless the screw has been tightened.

The maximum transverse diameter (B in Fig. 1) is best measured from behind the subject. Its terminal points will usually be found somewhere near B. There is no special difficulty in measuring it. All that the operator has to do is to watch the graduation of the cephalometer, so as to see when he has hit upon the maximum diameter. He must also see that the branches of the instrument on either side are in the same plane. *Vide* figures 2 and 3.

Fig. 2.—Antero-posterior diameter.

Fig. 3.—Transverse diameter.

In measuring the zygomata (posterior arches of cheek-bones) care must be taken to hold the instrument steady, as the points are apt to slip off the ridges of bone on one side or other, and thus to record too small a dimension. The measurement is the maximum breadth procurable with the cephalometer at the points F—F in figure 4. The index is formed with the bigoniac breadth E—E thus $\frac{\text{E—E} \times 100}{\text{F—F}}$.

Fig. 4.

E ... E Bigoniac breadth.

F ... F Maximum breadth of zygomata (posterior arches of cheek-bones).

Maxillary-zygomatic Index = $\frac{E \ldots E \times 100}{F \quad F}$

M ... M^1 = Bi-malar breadth.

M ... N ... M^1 or

N ... M × 2 = Naso-malar breadth.

$\frac{\text{Naso-malar line} \times 100}{\text{Bi-malar line.}}$ = Naso-malar index.

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Fig. 5.

~~IV A~~

Naso-Malar Index on Living Subject.

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M ... M'..... = Bi-malar breadth.

M ... N ... M' or M × 2 = Naso-malar breadth.

Nasal dimensions.—These are taken with the instrument which, for convenience of reference, I may call the nasometer (compas glissière de Broca). The lower point for the height of the nose is easily found. The nasometer being opened to the approximate height of the nose, the pointed end of the lower limb should be placed at the junction of the central nasal cartilage with the upper lip and pressed inwards and upwards until it meets with steady resistance from the nasal spine. The upper point also is easy to find in persons who have the root of the nose well defined. By feeling with the finger one can readily fix the point at which the bridge of the nose meets the frontal region of the skull and forms a depression or valley, the deepest point of which determines the measurement. This point can be either felt for and marked with red pencil or red ink before the instrument is applied, or can be ascertained by moving and adjusting the upper limb of the instrument itself. *Vide* C—C^1 in figure 1.

Some races, however, notably Mongolians, such as Tibetan, Limbus and the like, have no well-defined depression at the root of the nose. In such cases a close inspection of the root of the nose will disclose either one or two transverse folds or wrinkles of skin running at right angles to the direction of the nose. Where there are two folds, the point of the instrument should be placed between them; where there is only one, the instrument should be placed on the fold. The folds are usually to be found about two millimeters above the transverse axis of the eyes.

The width of the nose (D—D in Fig. 4) should be measured with the blunt ends of the nasometer. The object is to get the maximum width of the nostrils. The instrument therefore should just touch the skin on either side without depressing it.

I may mention here that all authorities agree in considering the dimensions of the nose the most valuable race characteristic that can be tested by measurement. Special care should therefore be taken in measuring these, the more so as, the figures being comparatively small, the averages will be more liable to be thrown out by any error. The measurements are, however, easy to take, and if carefully done show little variation in the hands of different operators on the same subject.

Naso-malar dimensions.—First make a pencil or red ink dot on the most posterior point on the front surface of the outer edge of each orbit. The normal situation of these points is shown at M and M^1 in figures 4 and 5. They can readily be ascertained by feeling with the finger. Then make a similar dot on the centre of the bridge of the nose at the most posterior point. See the point marked N in figures 4 and 5. This point will correspond exactly with the "upper point" of the nasal height described above. Care must of course be taken to place the dot exactly in the centre of the nose.

Having made the three dots in the manner described above, measure with the nasometer the distance between the two orbital

dots (M and M^1) *in a direct line*. This will give the "bimalar breadth," and should be entered in column 24.

Then measure with the same instrument the distance from either of the orbital dots (M or M^1) to the nasal dot (N), *and double the result*. This will give the "naso-malar breadth," and should be entered in column 25. It will perhaps be the safest plan to test the distance from each dot (M and M^1) to the dot N before doubling.

Figure 5 shows the points for the index on the living subject.

The index is

$$\frac{\text{Naso-malar breadth} \times 100}{\text{Bimalar breadth}}$$

to be entered in column 26.

Vertical proportions of the head.—These are the only measurements which present any serious difficulty, and after several experiments I hope that a mode of overcoming this difficulty has been discovered. The measurements are taken with the graduated T—square (*Equerre céphalométrique*), and the smaller steel sliding scale or the wooden triangular slide. Their accuracy depends upon the subject's head being exactly upright, and being kept in that position while the measurements are going on. There appear to be two recognised methods for placing the subject's head in an upright position. The first, devised by Dr. Barclay in 1803, consists in making the subject hold with his teeth a flat plate of metal mechanically levelled. Topinard discusses this plan and condemns it as too complicated. For use in this country it is open to the further objection that unless all the subjects operated on at the same time belong to the same caste and sub-caste, the plate of metal would have to be continually washed in deference to caste prejudices. It also appears to me that if a man has got a plate of metal between his teeth, the height from the top of his head to the bottom of his chin cannot be correctly measured, and will in practice vary considerably. The second method, which Topinard prefers, "consists in directing the subject to look steadily at the horizon, and in correcting the position of his head if by accident or through nervousness he does not look straight before him in the natural manner." In this manner, Topinard adds, the head will be adjusted in accordance with the plane of vision, and will necessarily assume a correct position for the purpose of measurement.

We must, I think, take it on Topinard's authority that the head can be correctly placed by following these instructions. We are met, however, by the further difficulty that after the correct position has been ascertained the subject cannot keep his head absolutely still, and that every movement, however slight, materially affects the measurements. Having got the correct position, we want

to fix it, in order that there may be no movement while the measurements are going on, and in order that the position may, if necessary, be reproduced for the purpose of repeating and testing measurements already taken. For this purpose I have had a small clamp, with a horizontal bar attached to it, made by the Mathematical Instrument Department. The clamp runs on the height measure which is in the box, and is used in the following manner.

Adjust the subject's head correctly by the plane of vision as explained above. Then place the height measure with its plummet attached on the left side of the subject, and see by observing the plummet that the measure is upright. Run the clamp up until the horizontal bar attached to it touches the central cartilage of the subject's nose, and renders it impossible for him to depress his head. Then screw the clamp tight. The bar will rest exactly at the junction of the upper lip with the central cartilage—at the point, in fact, which forms the lower starting point for the measurement of the height of the nose (C—C^1 in Fig. 1). So long as the subject rests his nose on this bar he will be in the correct position as previously ascertained; and if the height of the bar on the graduations of the height measure is noted, the position can be reproduced at any moment. In fact the sources of error are reduced to one—the possibility of the subject raising his head—and this can be easily guarded against by seeing that his nose is tightly pressed against the horizontal bar.

It will be seen the horizontal bar in no way interferes with the process of measuring. It may even assist it, if the vertical arm of the T—square be steadied against the horizontal bar in taking the dimensions from vertex to tragus.

The position of the head being thus secured, a few remarks may be added on the details of the measurements.

Height from vertex to intersuperciliary point (H—I in Fig. 1).—The intersuperciliary point is defined by Topinard as "situated in the centre of a line drawn at a tangent to the convex surfaces of both eyebrows." It can be ascertained by laying the smaller metallic slide across the eyebrows, and drawing a line with red pencil along its upper edge, or simply by turning the slide slightly and pressing in the upper edge, so that it makes a slight depressed mark in the skin. The mark will last long enough to enable the measurement to be taken, and is perhaps more accurate than a pencil line. On the other hand, if a pencil line is made, the measurement can be repeated with greater certainty.

Height from vertex to chin.—This dimension is entered in column 29 of the register. It can, however, be most conveniently taken immediately after the height from vertex to intersuperciliary point, as the T—square is in exactly the same position throughout. Care must be taken to read from the *upper* edge of the slide in measuring the chin dimension. The *lower* edge gives the reading for the intersuperciliary point if (as should be the case) the sharp point

of the slide is touching the line drawn at a tangent to the convex surfaces of the eyebrows.

Height from vertex to tragus (H—K in Fig. 1).—According to Topinard, the point to be measured to is the centre of the tragus. K in Figure 3 is therefore a trifle too low.

Facial angle of Cuvier (ONX in Fig. 6).—A special instrument is provided to measure this angle. The subject holds between his teeth the small projection in the centre of the instrument: the bosses are put into his ears and held there; and the indicator is adjusted so that the round knob at the end of it touches the glabella. The angle is then read off on the scale. It should be observed that the *upper* front teeth are the point which determines the angle. If by reason of any malformation of the teeth the subject cannot grip the instrument himself, the operator should hold the instrument so that the projection is in contact with the upper front teeth. Care should be taken that the flexible band of steel which passes through the ear bosses is drawn fairly tight, and the instrument should be given time to settle before the angle is read off. When persons of different castes or sub-castes are being measured at the same time, each subject should, if he wishes to do so, be allowed to wash the part of the instrument which touches his teeth, after it has been used by another person. The instrument must not be roughly handled or bent in the process of washing, and must be oiled very thoroughly afterwards.

Circumference of the chest.—This is measured with the tape, the lower edge of which should rest on the nipples, the arms being raised while the tape is adjusted and afterwards lowered. The ends of the tape are held by the operator standing behind the subject. Care must be taken that the tape is in a true horizontal plane perpendicular to the axis of the thorax. The dimension should be read when the breathing is at rest, midway between inhalation and expiration.

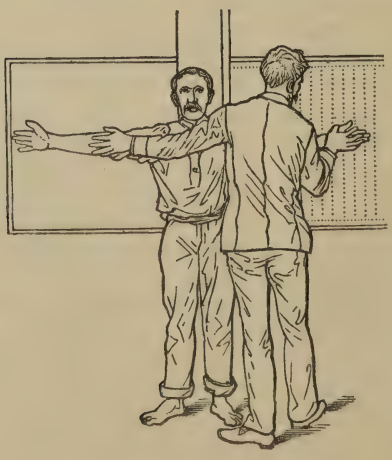
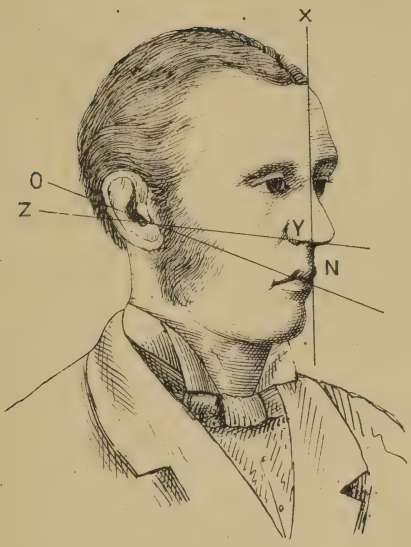


Fig. 7.—Grande envergure.

Grande envergure or length from third finger to third finger, the arms being fully extended at right angles to the body. This is best taken by making the subject extend his arms against a wall and marking the points which his fingers reach. The distance between the points can then be measured with the standard, not with the tape. *Vide* figure 7.

Fig. 6.



XYZ. Facial angle of CAMPER.

ONX. Facial angle of CUVIER, recommended by TOPINARD for the living subject.

Reg. No. 646, Bengal, G1.—Jan. 93.—1,500.

Litho, S I. O., Calcutta.

Height sitting.—Make the subject sit against a wall, so that the whole of his back, from the sacrum to the shoulders, shall be in contact with the wall, as in Fig. 8. Measure with the standard from the ground to the top of his head. He should not be allowed to sit on the ground, but on some article of known height, such as the box of instruments, the height of which, 10 centimetres, should be deducted from the measurement obtained. The legs should be extended and parallel.

Fig. 8.—Height sitting.

Height kneeling.—Make the subject kneel on both knees, taking care that the thigh is perpendicular to the ground and that there is no stooping. Then measure to the top of the head with the long standard.

Height to junction of sternum and ribs.—Make the subject stand with his back to the wall and measure with the long standard from the ground to the *fourchette sternale*, *i.e.*, to the junction of the sternum with the ribs. The point to be taken is the lower end of the *gladiolus*, not the ensiform cartilage, which lies below and is not so easily reached.

Bigoniac breadth.—Measure with the cephalometer the maximum breadth of the outer surfaces of the inferior maxillary bone from one angle to the other (E—E in Fig. 1). Plate No. 56 at page 55 of the ninth edition of Gray's Anatomy shows the angle, which is the point to be taken.

Fig. 9.—Length of fore-arm.

Length of the fore-arm.—Measure with the sliding scale (*glissière anthropométrique*) from the olecranon process of the ulna to the end of the middle finger, the left arm being laid on a table as in figure 9. *Vide* plate 220 in Topinard's *Eléments d' Anthropologie Générale.*

Length of left foot.—Measure maximum length from toe to heel with the sliding scale (*glissière anthropométrique*) as in figure 10.

Fig. 10.—Length of left foot.

Length of middle finger of left hand.—Measure with sliding scale (*glissière anthropométrique*) as in figure 11.

Fig. 11.—Length of middle finger of left hand.

Maximum breadth of the shoulders.—Measure with sliding scale (*glissière anthropométrique*) from the external face of the head of the humerus where it is covered by the deltoid muscle.

Maximum breadth of hips.—Measure with sliding scale (*glissière anthropométrique*) the maximum breadth from the external surfaces of the spines of the ilia (*crêtes iliaques* in Topinard's plate 212).

General.—In reading all the instruments fractions of a millimeter should be disregarded, and the nearest whole figure taken. In practice it rarely happens that the indicator exactly divides a millimeter.

Minute accuracy in measuring is the one essential point. Inaccurate measurements are not merely worthless and misleading in themselves, but will throw out the averages of the whole set of figures concerned. If therefore a doubt arises as to the accuracy of any particular dimension, the measurement should be repeated. If after several trials the results still vary, an average should be struck, and that average entered in the form.

All the instruments should be carefully oiled after use with crude Rangoon oil or vaseline.

A specimen of the hair of each caste or tribe measured should be sent up for examination. It should be about 2 inches long and cut from the middle of the head, tied round with tape, ticketed with the name of the caste or tribe securely fastened to the tape, and placed in an envelope with the name of the caste legibly written on it in Roman character.

DARJEELING, H. H. RISLEY.

The 20th September 1886.

PHYSICAL CHARACTERISTICS.

I.—SCHEDULE.

Of Observations of External Characters.

Preliminary Particulars.

No. ..... Date .....

Sex ..... Age .....

Tribe ..... Locality .....

Language or dialect .....

General condition—

(1) Stout. (2) Medium. (3) Thin.

Descriptive Characters.

A.—Colour of skin on parts not exposed to the air?—

Black ... { Absolute (1). Sooty (2).

Brown ... { Reddish (3). Yellowish (4).

Red (5).

Yellow (6).

White ... { Yellowish (7). Brownish (8). Pale (9). Rosy (10).

B.—Colour of eyes?—

Dark of all shades (1).

Medium ... { All medium shades, except green (2). Green (3).

Light ... { All light shades, except blue (4). Blue (5).

C.—Fold of skin at inner angle of eye?—

(0) Absent. (1) Vestige remaining. (2) Covering $\frac{1}{3}$ to $\frac{1}{2}$ the caruncle. (3) Covering the caruncle.

D.—Colour of hair?—

(1) Black. (2) Dark brown. (3) Medium. (4) Blond or fair of all shades. (5) Red.

(If possible, a lock of hair should be attached to the schedule.)

E.—Character of hair?—

(1) Straight. (2) Undulating or wavy. (3) Curly. (4) Woolly.

F.—Amount of hair { On the face? On the body?

(0) Absent. (1) Scarce. (2) Medium. (3) Abundant.

G.—Shape of face?

(1) Long and narrow. (2) Medium. (3) Short and broad. (4) Pyramidal, *i.e.*, narrowing upwards. (5) Wedge-shaped, *i.e.*, pointed towards chin.

H.—Profile of nose?—

(1) Straight. (2) Aquiline. (3) Concave or turned up. (4) High bridged. (5) Sinuous or wavy. (6) Chinese type. (7) Negroid type. (8) Australoid type.

I.—Prognathism or prominence of the region of the mouth?

(0) Absent. (1) Slight. (2) Moderately marked. (3) Considerable.

J.—Lips—

(1) Thin. (2) Medium. (3) Thick. (4) Everted.

K.—Prominence of face transversely?—

Proprosopic (face prominent, cheek bones not perceptible).	Considerable (1). Moderate (2). Mesoprosopic (3).
Platyprosopic (face flat, cheek bones conspicuous).	Well marked (4). Excessive (5).

II.—EXPLANATION OF SCHEDULE.

The "Preliminary Particulars" require some explanation. The *age* may offer some difficulty on account of the person not being able to express it; in such cases the observer must indicate it to the best of his judgment, inserting the word "about" before the number he enters for it.

The condition of the body is to be noted, as it may explain some peculiarity in the measurements which might be thought to be due to error. To save time and trouble in writing, numbers within brackets are attached to each of the conditions, so that if the person is thin, it will be sufficient to write "3" in the blank column. This plan is also to be followed in recording the descriptive characters which follow.

The "Descriptive Characters" are next to be recorded, and while this is being done the observer may engage the subject in conversation, so as to gain his confidence and overcome any fear or repugnance he may have to be measured. When the colour or form in the subject does not correspond to any in the schedule, but is intermediate between two colours or forms, the two numbers between which it lies should be entered in the blank column. If any difficulty is found in answering the questions in the schedule, reference should be made to the section Descriptive Characters for further explanation.

III.—DESCRIPTIVE CHARACTERS.

In the following sections the various particulars regarding the Descriptive Characters asked in the Schedule are explained, and others supplementary to them which may with advantage be noted by the traveller are given.

Skin.

The colour of the skin should be indicated on Dr. Topinard's system as follows:—

Is the skin—1. Black, coal-black? 2. Sooty-black? 3. Dark reddish-brown, chocolate? 4. Dark yellow brown, dark olive? 5. Red, copper-coloured? 6. Yellow, olive? 7. Yellowish-white? 8. Brownish-white? 9. Pale white? 10. Florid or rosy?

A very convenient part to observe in clothed persons is usually the outer part of the upper arm. The part chosen should be stated in any case.

1. Is the skin smooth and velvety, or coarse and rough?
2. Is the oily excretion abundant?
3. Do the parts covered differ much in colour from those exposed to the sun?
4. Do different castes or sections of the population differ notably in colour?
5. What is the prevailing colour or complexion in parts *not* habitually exposed?
6. And what in those habitually exposed to weather and sunshine? Do freckles occur?

Eye.

The colour of the iris is very important; next in importance are the form and position of the opening.

Topinard's plan of denoting colour recognises four classes:—

1. *Dark.*—Including those which are called black-brown, dark hazel, &c.

2. *Medium or Neutral.*—Such as cannot at once, in a good light, be distinguished as light or dark. Among these are the dark greys; most of the greens; those with a predominance of orange towards the centre, but of grey and light green elsewhere, &c.

Light { 3. Other than blue (light grey, very light, green, &c.)
4. Blue.

What are the relative proportions of these four classes? The eyes should be examined from a moderate distance, so as to get a general impression of the colours.

Forms and positions:—Are the eyes placed with their long axis nearly in one horizontal plane (as in most Europeans), or are their outer angles more or less visibly elevated (as in many or most Chinese)? Are they deeply set, or *à fleur de tête*, prominent? Is the upper eyelid thick? Does it turn down at the inner angle, covering more or less the caruncle? Does the outer angle of the opening appear compressed and pointed, so as to suggest an almond shape?

Hair.

1. Is the colour in adults—1. Black, coal-black? 2. Dark brown? 3. Medium, chestnut brown? 4. Fair blond, yellow, or flaxen? 5. Red auburn?

Only adults whose hair has not begun to turn grey should be selected for this purpose. The shades are best discriminated not in sunshine, but in the shade on a bright, clear day.

2. If the hair in adults is always or usually black, what colours prevail among children?

3. Is the natural colour of the hair interfered with in any way? Some races dye the hair.

4. Is there any colour which is preferred to others?

5. Obtain specimen locks at different ages, if possible, viz., (*a*) at birth, (*b*) between 1 and 2 years, (*c*) 2 and 4, (*d*) 4 and 8, (*e*) 8 and 16, (*f*) adult.

6. Is the hair straight, slightly or much waved, curly or frizzly, or what is called woolly?

7. If curly or frizzled, is this due to nature or art?

8. Is it in great quantity?

9. What length does it attain, whether measured by the apparent distance between points and roots of the locks, or by stretching individual hairs?

10. Does it grow in separate tufts? or is it uniformly scattered over the hairy scalp?

11. Are the hairs coarse or fine in texture? round, flattened or kidney-shaped in section?

12. Have the males any beard? If not, are they beardless by nature, or do they pluck out or otherwise destroy the beard?

13. On what parts of the body besides the head, armpits, and pubes does hair grow? at what age does it begin to grow on the different parts? and in what quantities?

14. What is the difference between male and female in this respect?

15. What difference is observed in the quality and colour of the hair on different parts of the body?

16. In what direction does the hair grow on different parts of the body, hands, arms, legs, &c.?

17. At what age do greyness and baldness appear? and in what parts first?

Form of Face.

Where exact measurements of the facial features cannot be obtained, answers to the following questions may supply their place:—

1. Is the face, in a front view, square, oblong, round, elliptic, short-oval, long-oval, shield-shaped (like an escutcheon), or wedge-shaped?

2. In profile is it convex or concave?

3. In profile also, are the chin, the nose, the mouth, the eye-ridges markedly prominent? and of the supra-orbital region are

the eye-ridges proper, or the glabella (central boss) the more prominent ?

4. Is the nose straight, aquiline, hooked, concave, high-bridged (*busqué*), clubbed, or sinuous ? or has it the Chinese type (straight but flat), or the negroid (short, broad, nearly straight), or the Australoid or Papuan (broad, with the lower part forming a flattened and depressed hook) ?

5. Is the chin broad, narrow, angular, or round ?

6. Are the cheekbones broad, prominent forwards, or inconspicuous ? or is the face in this region flat ?

7. Are the lips thin, medium, or thick, or is the upper lip turned upwards and the lower lip turned downwards ?

8. Are the ears large or small, flat or outstanding, simple or finely developed ?

9. Are the lobes large or absent, attached or detached ?

Further notes on the same subject.

Proprosopic and platyoprosopic are terms used to indicate whether the middle part of the face, between the level of the lower part of the nose and the supra-orbital level above, projects forward or is flat. In the former the breadth of the face at the level of the cheekbones appears diminished by these bones receding or being as it were pressed inwards; so that the face curves regularly forward from the ears to the nose, the latter is consequently prominent and appears as a keel on the top of the arch. In the second the face is broad and flat in appearance, the cheekbones are prominent, and in extreme forms the side and front of the face are almost at right angles to one another, the bend of the angle being at the cheekbones, and the nose appears as if projecting from an almost flat surface. Extreme forms of the first type are frequently seen amongst English people, while the most marked type of the second is met with in the Eskimo and of the Chinese.

MEDICAL SECTIONS.

I.—Reproduction.

1.—*Manners and customs affecting the sexes previous to marriage.*

(*a*) Relating to males :—

Is there any evidence of special physical training for sexual purposes before or after puberty and preparatory to marriage (*e.g.*, circumcision, the "mika" operation, *i.e.*, artificial hypospadias, &c.) ? Is there any minimum limit of age ? Is any proof of virility required ? Is promiscuous intercourse, with or without precautions against pregnancy, permitted before marriage ? If so, what steps are taken to enforce the rules, and what punishment follows their breach ?

(*b*) Relating to females :—

Is there any special interference with the sexual organs in girls previous to puberty (*e.g.*, dilatation of organs, closure of vulva, &c.) ? Is there any minimum limit of age? Is connection permitted before marriage, or what steps are taken to ensure chastity or prevent pregnancy?

II.—Menstruation.

At what age does menstruation usually occur? Are there any special customs or superstitions connected with (1) ordinary, (2) precocious, (3) deferred menstruation? Is purification practised subsequent to each menstruation?

III.—Marriage.

What is the average age of both sexes at marriage? Note any special customs relating to marriage ceremonies?

IV.—Pregnancy.

What means are adopted for determining that a woman is pregnant? Is she debarred from cohabitation or otherwise secluded during pregnancy? Note any special diet or other customs during pregnancy relating either to husband or wife (*e.g.*, the "couvade," &c.)?

V.—Labour.

What preparations are made in anticipation of labour (*e.g.*, as to food, dwelling, bed, assistance, seclusion, &c.)? What position is usually adopted? Note exceptions and reason for the same. What is the average duration of labour? Note any customs or superstitions regarding the caul, treatment of cord, disposal of placenta, &c. Are difficult labours common? To what are they chiefly due? How and by whom are complications treated? If a woman dies undelivered, are any means taken to save the child?

VI.—The Puerperium.

How long is a woman confined to bed? Is she subject to any special diet, system of purification, &c.?

VII.—Lactation.

What is the average duration of suckling? Is any special diet enforced? Is she restrained from sexual intercourse during this period?

VIII.—The Child.

How is the child treated immediately after birth? How are still-born children resuscitated? Is there any special treatment of

the head? Are there any special customs with regards to twins or preternatural births? Are there any customs or ceremonies connected with the naming of the child akin to baptism?

IX.—General.

What is the average number of a family? What is the relative proportion of sexes? What is the greatest number in a family? How many have been produced by one mother, and of these how many grew up? Do twins or triplets, &c., occur frequently? Ascertain, if possible, the total number of boys and girls respectively born in one given area or tribe. (This is of importance in districts where polyandry exists.) Are there any restraints on population? Is sterility in woman common? Is want of virile power complained of by men? Are drugs or other means used to produce abortion or stimulate sexual desire and power? If so, what are they? Are births out of wedlock common? What is done with the children? Whether do the lower or upper classes produce the larger families? Does population seem to be increasing, or the reverse, judging by extent of occupied land, size of cemeteries, ruins of villages, &c., as well as by report? Can the ratio of births and deaths in a community of known population be obtained.

Note.—The above questions and instructions have been taken, with slight modifications, from the second edition (1892) of Notes and Queries on Anthropology, edited for the Council of the Anthropological Institute, by John George Garson, M.D., and Charles Hercules Read, F.S.A.

FORM I.

Form I.

Measurements of *members of the*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Serial number.	Name.	Caste or tribe.	Sub-caste, or sub-tribe endogamous.	Section, or sept exogamous.	District of birth.	Age.	Measurement round chest.	Measurement with extended arms.	Height.	Height sitting.	Height kneeling.	Height lower end of gladiolus.	Weight in pounds.	Cephalic length.	Cephalic breadth.	Cephalic index.

caste taken at *on the* 189 .

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Bimaxillary or bigoniac breadth.	Maximum bizygomatic breadth.	Maxillary-zygomatic index.	Nasal height.	Nasal width.	Nasal index.	Bimalar breadth.	Naso-malar breadth.	Naso-malar index.	Height from vertex to intersuperciliary point.	Height from vertex to tragus.	Height from vertex to chin.	Facial angle.	Length of fore-arm.	Length of left foot.	Length of middle finger of left hand.	Maximum breadth of hips.

Signed _____

W. J. & R. D'R.—Reg. No. 3696J—1,500—26-1-93.